

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Reissue
Application of: Bill L. Davis and Jesse S. Williamson

Entitled: COMBINED LITHOGRAPHIC/FLEXOGRAPHIC
PRINTING APPARATUS AND PROCESS

For: Reissue of U.S. Patent 5,630,363

Filed: May 20, 1999

Serial No.: 09/315,796

Examiner: Not Yet Assigned

Group Art Unit: 2854

SUPPLEMENTAL STATEMENT OF PRIOR ART AND OTHER INFORMATION

APPENDIX 7

VII. File History Pertinent to Series Commencing with United States Serial No.
08/538,123 filed October 2, 1995 issued as U.S. Patent No. 5,651,316 on July 29, 1997

Index No. Description

67
File History of European Patent Application No. EP 0 767 054 A3 entitled: Printing or Coating Unit for a Rotary Offset Printing Press, Applicant: Howard W. DeMoore, Inventors: Howard W. DeMoore, Ronald M. Rendleman and John W. Bird, Filed on October 2, 1996, Date of Publication A3: April 29, 1998, Date of Publication A2: April 9, 1997

09415706-004401



EPA/EPO/OEB
D-80298 München
089/2399-0
TX 523 656 epmu d
FAX 089/2399-4465

Europäisches
Patentamt

European
Patent Office

Office européen
des brevets

Generaldirektion 2

Directorate General 2

Direction Generale 2

BIRD & BIRD
ATTN: MS. CECILIA CHEUNG
90 FETTER LANE
LONDON EC4A 1JP
GREAT BRITAIN

Rechnung / Invoice / Facture

Kundennummer
Customer number 01500251
Numéro du client

Datum/Date

20/07/99

| | |
|--|--|
| Zeichen/Ref./Réf. LIBRY.0666 | Anmeldung Nr./Application No./Demande n°/Patent Nr./Patent No./Brevet n° 96250219.1 2304 0767054 |
| Anmelder/Applicant/Demandeur/Patentinhaber/Proprietor/Titulaire DeMoore, Howard W. | |

Übersendung von/Transmission of/Envoi de

Antrag vom/Request dated/Requête du 18/06/99

- ☒ Kopien bei Akteneinsicht nach Regel 94(3) EPÜ
Copies in the case of inspection of files pursuant to Rule 94(3) EPC
Copies en cas d'inspection publique selon la règle 94(3) CBE
- ☐ Beglaubigung
Certification
Certification
- ☐ ——— Prioritätsbeleg(e)/priority document(s)/document(s) de priorité R. 94(4)
- ☐ ——— Ausfertigung(en) der Patenturkunde nach Regel 54(2) EPÜ
Duplicate of the patent certificate pursuant to Rule 54(2) EPC
Duplicata du certificat de brevet, selon la Règle 54(2) CBE
- ☐ Auszug aus dem Register nach Regel 92(3) EPÜ
Extract from the register pursuant to Rule 92(3) EPC
Extrait du registre selon la Règle 92(3) CBE
- ☐ Auskunft aus den Akten nach Regel 95 EPÜ
Communication of information contained in the files pursuant to Rule 95 EPC
Communication d'informations contenues dans la dossier selon la Règle 95 CBE
- ☐ Akteneinsicht nach Regel 94(2) EPÜ
Inspection of files pursuant to Rule 94(2) EPC
Inspection publique selon la Règle 94(2) CBE

Rechnung Nr./Invoice No./Facture N° 20189458

Bitte bei Zahlung unbedingt angeben
Indicate number without fail when paying
Ce n° doit absolument être indiqué lors du paiement

EUR

Gegenwert
Equivalent **GBP**
Contre-valeur

| | | |
|---|--------|-------|
| Verwaltungsgebühr/Administration fee/Taxe d'administration | 20,00 | 13,50 |
| Kosten für Kopien/Cost of copies/Frais pour copies (186 Blätter/ pages/ feuilles) | 111,60 | 74,40 |
| Telefax | 0,00 | 0,00 |
| Summe/Total/Montant total | 131,60 | 87,90 |
| gezahlt sind/already paid/montant versé | 0,00 | 0,00 |
| noch zu zahlen/outstanding/reste à payer | 131,60 | 87,90 |

☐ Der obengenannte Betrag wird abgebucht vom laufenden Konto
The above sum will be debited from deposit account
Le montant susmentionné sera débité du compte courant

Nr.
No.
n°

☒ Der obengenannte Betrag ist nach den auf der Anlage angegebenen Zahlungsmöglichkeiten zu entrichten (f. 2566.1 + 2).
The above sum is payable as detailed on the annex (f. 2566.1 + 2).
Le montant indiqué ci-dessus doit être acquitté suivant les modalités figurant sur l'annexe (f. 2566.1 + 2).

GARRY A G (TEL: 2375)



Zahlungsmöglichkeiten

Nach Art. 5 der Gebührenordnung können die Gebühren wie folgt entrichtet werden:

- a) durch Einzahlung oder Überweisung auf ein Bankkonto des Amts,
- b) durch Einzahlung oder Überweisung auf ein Postscheckkonto des Amts,
- c) durch Übergabe oder Übersendung von Schecks, die an die Order des Amts lauten,
- d) durch Abbuchung von einem laufenden Konto beim Amt.

Die Zahlungswährung richtet sich nach der Währung des Staats, in dem das Konto geführt wird.

Der Betrag ist "ohne Kosten für den Empfänger" zu überweisen.

Das Verzeichnis der für die Europäische Patentorganisation eröffneten Bank- und Postscheckkonten, sowie der entsprechenden Zahlungswährungen ist auf Form 2566.2 abgedruckt.

Methods of payment

Under Art. 5 of the rules relating to Fees the fees may be paid as follows:

- a) by payment or transfer to a bank account held by the Office,
- b) by payment or transfer to a giro account held by the Office,
- c) by delivery or remittance of cheques which are made payable to the Office,
- d) by debiting a deposit account held with the Office.

The currency for payment is determined by the currency of the State in which the account is held.

The fee is to be transferred "at no costs to the payee".

The list of bank and giro accounts opened in the name of the European Patent Organisation and corresponding currencies for payment is reproduced on Form 2566.2.

Modalités de paiement

Aux termes de l'article 5 du Règlement relatif aux taxes, les taxes peuvent être acquittées comme suit:

- a) par versement ou virement à un compte bancaire de l'Office,
- b) par versement ou virement à un compte chèques postal de l'Office,
- c) par remise ou envoi de chèques établis à l'ordre de l'Office,
- d) par prélèvement sur un compte courant ouvert auprès de l'Office.

Le paiement doit être effectué dans la monnaie de l'Etat où le compte est ouvert.

Le virement doit se faire "sans frais pour le destinataire".

La liste des comptes bancaires et de chèques postaux ouverts au nom de l'Organisation européenne des brevets et des monnaies de paiement correspondantes est reprise sur le formulaire Form 2566.2.

| | Bankkonten Bank accounts Comptes bancaires | Postcheckkonten Giro accounts Comptes de chèques postaux | Zahlungswährung Currency for payment Monnaies de paiement |
|----|---|--|---|
| AT | N° 102-133-851/00 (BLZ 12000) Bank Austria AG Am Hof 2 A-1010 Wien | N° 7451 030 Österreichische Postsparkasse Georg-Coch-Platz 2 A-1018 Wien | Österr. Schilling (ATS/EUR) |
| BE | N° 310-0449878-78 Banque Bruxelles Lambert BP 348 B-1000 Bruxelles | N° 000-1154426-29 Banque de la Poste B-1100 Bruxelles | Franc belge (BEF/EUR) |
| CH | N° 322 005 01 B UBS CH-8021 Zurich | N° 30-30796-1 Zahlungsverkehr PTT Verarbeitungszentrum CH-4040 Basel | Franc suisse (CHF) |
| CY | N° 0155-06-000-650 Bank of Cyprus 21, Evagoras Av. P. O. Box 1472 CY - 1599 Nicosia | | Cyprus Pound (CYP) |
| DE | N° 3 338 800 00 (BLZ 700 800 00) Dresdner Bank Promenadeplatz 7 D-80273 München | N° 300-800 (BLZ 700 100 80) Postbank München D-80318 München | Deutsche Mark (DEM/EUR) |
| DK | N° 3015133759 Den Danske Bank Holmens Kanal Dept Holmens Kanal 2 DK-1090 København K. | N° 899-5893 GIROBANK A/S Girostrøget 1 DK-0800 Høje Taastrup | Danske kroner (DKK) |
| ES | N° 0104/0328/95/0303480024 Banco Exterior de España Carrera de San Jerónimo 36 E-28014 Madrid | N° 00-18716786 Caja Postal Cuentas Extranjeras Pº de Recoletos, 5 E-28070 Madrid | Peseta española (ESP/EUR) |
| FI | N° 200118-182076 Merita Bank Senaatorintori FIN-00020 Merita | N° 800013-90405 Leonia Fabianinkatu 23 FIN-00007 Helsinki | Suomen Markka (FIM/EUR) |
| FR | N° 200 20463, Code banque 30 004, Code guichet 00 567, Cle Rib 29 Banque Nationale de Paris Agence France-Etranger 2 Place de l'Opéra F-75002 Paris | | Franc français (FRF/EUR) |
| GB | N° 60 271 489 (sorting-code 20-00-00) Barclays Bank PLC 54 Lombard Street P.O. Box 544 GB-London EC3V 9EX | | Pound Sterling (GBP) |
| GR | N° 112002002007046 Credit Bank AE Athens Tower Branch 2, Messoghion Avenue GR-115 27 Athens | | Greek Drachma (GRD) |
| IE | N° 30982201 (Bank Code 90-14-90) Bank of Ireland Lower Baggot Street Branch P.O. Box 3131 IRL-Dublin 2 | | Irish pound (IEP/EUR) |
| IT | N° 936832 01 94, ABI 02002 / CAB 03200 Banca Commerciale Italiana Via del Plebiscito 112 I-00186 Roma | N° 10568277 Poste Italiane C.U.A.S. Piazza Vesuvio 6 I-20144 Milano | Lire italiana (ITL/EUR) |
| LU | N° 7-108/9134/200 Banque Internationale à Luxembourg 69, route d'Esch L-2953 Luxembourg | N° 25421-37 Administration des P & T Chèques postaux BP 2500 L-1090 Luxembourg | Franc belge (BEF/EUR) |
| MC | N° 254 22754, Code Banque 30 004, Code Guichet 09 179, Cle Rib 91 Banque Nationale de Paris Succursale de Monte-Carlo Galerie Charles III Avenue des Spélugues Boîte Postale 129 MC-95007 Monaco Cedex | | Franc français (FRF/EUR) |
| NL | N° 51 36 38 547 ABN-AMRO Bank NV Kneuterdyk 1, Postbus 165 NL-2501 AP Den Haag | N° 4012627 Postbank NV NL-6800 MA Arnhem | Nederlandse Gulden (NLG/EUR) |
| PT | N° 0015/020 0808391145 / 05 Banco Pinto et Sotto Mayor Av. Fontes Pereira de Melo 7 P-1000 Lisboa | | Escudo português (PTE/EUR) |
| SE | N° 122 687 108 Bankgiro N° 5843-6155 Svenska Handelsbanken S-10670 Stockholm | N° 7 41 53-8 Postgirot S-10506 Stockholm | Svenska kronor (SEK) |



Antrag auf Erteilung eines europäischen Patents / Request for grant of a European patent / Requête en délivrance d'un brevet européen

Bestätigung einer bereits durch Telekopie (Telexfax) eingereichten Anmeldung / Confirmation of an application already filed by facsimile / Confirmation d'une demande déjà déposée par télécopie
Wenn ja: Datum der Übermittlung der Telekopie und Name der Einreichungsbehörde / If yes: facsimile date and name of the authority with which the documents were filed / Si oui: date d'envoi de la télécopie et nom de l'autorité de dépôt

07-10-1996

Datum / Date

Behörde / Authority

Nur für amtlichen Gebrauch / For official use only / Cadre réservé à l'administration

Anmeldenummer / Application No. / N° de la demande

MIKEY

1

70250219.1

Tag des Eingangs (Regel 24(2)) / Date of receipt (Rule 24(2)) / Date de réception (règle 24(2))

DREC

2

02.10.1996

Tag des Eingangs beim EPA (Regel 24(4)) / Date of receipt at EPO (Rule 24(4)) / Date de réception à l'OEB (règle 24(4))

RENA

3

Anmeldetag / Date of filing / Date de dépôt

4

Tabulieren-Positionen / Tabulation marks / Arrêts de tabulation

Es wird die Erteilung eines europäischen Patents und gemäß Artikel 94 die Prüfung der Anmeldung beantragt / Grant of a European patent, and examination of the application under Article 94, are hereby requested / Il est demandé la délivrance d'un brevet européen et, conformément à l'article 94, l'examen de la demande

EXAM 4

5

Prüfungsantrag in einer zugelassenen Nichtamtssprache (siehe Merkblatt II, 5) / Request for examination in an admissible non-EPO language (see Notes II, 5) / Requête en examen dans une langue non officielle autorisée (voir notice II, 5)

Zeichen des Anmelders oder Vertreters (max. 15 Positionen) / Applicant's or representative's reference (maximum 15 spaces) / Référence du demandeur ou du mandataire (max. 15 caractères ou espaces)

AREF

6

P 44213

ANMELDER / APPLICANT / DEMANDEUR
Name / Nom

7

Howard DeMoore

Anschrift / Address / Adresse

8

10954 Shady Trail
Dallas, Texas 75220
U.S.A.

APPR 01 #

DEST

Zustellanschrift / Address for correspondence / Adresse pour la correspondance

9

PADR

Staat des Wohnsitzes oder Sitzes / State of residence or of principal place of business / Etat du domicile ou du siège

10

Staatsangehörigkeit / Nationality / Nationalité

11

Telefon / Telephone / Téléphone

12

Telex / Télex

Telefax / Fax / Téléfax

13

Weitere(r) Anmelder auf Zusatzblatt / Additional applicant(s) on additional sheet / Autre(s) demandeur(s) sur feuille additionnelle

14

VERTRETER / REPRESENTATIVE / MANDATAIRE:
Name / Nom

15

(Nur einen Vertreter angeben, der in das europäische Patentregister eingetragen und an den zugestellt wird / Name only one representative, who is to be listed in the Register of European Patents and to whom notification is to be made / N'indiquer qu'un seul mandataire, qui sera inscrit au Registre européen des brevets et auquel signification sera faite)

FREP 01

Geschäftsanschrift / Address of place of business / Adresse professionnelle

16

UEXKÜLL & STOLBERG
Patentanwälte
Beselerstr. 4

D-22607 Hamburg

Zusammenschluß/Association Nr.1

Telefon / Telephone / Téléphone

17

(040) 899 6540

Telex / Télex

Telefax / Fax / Téléfax

18

(040) 899 654 88

Weitere(r) Vertreter auf Zusatzblatt / Additional representative(s) on additional sheet / Autre(s) mandataire(s) sur feuille additionnelle

19

EPA/EPO/OEB Form 1001 1 10 95

TRAN

FILL

1/1

P 44213

Raum für Zeichen des Anmelders / Space for applicant's reference / Espace réservé à la référence du demandeur

0915736 051401

1

Vollmacht / Authorisation / Pouvoir:

ist beigefügt / is enclosed / ci-joint

ist registriert unter Nummer / has been registered
under No. / a été enregistré sous le n°

GENA

Nummer
Number
Numéro

ERFINDER / INVENTOR / INVENTEUR:

INVT 20 # #

Anmelder ist (sind) alleinige(r) Erfinder / The applicant(s) is (are)
the sole inventor(s) / Le(s) demandeur(s) est (sont) le (les) seul(s)
inventeur(s)Erfindernennung auf gesondertem Schriftstück / Designation of
inventor attached / Voir la designation de l'inventeur ci-jointeBEZEICHNUNG DER ERFINDUNG / TITLE OF INVENTION /
TITRE DE L'INVENTION:

TIDE

TIEN

TIFR

Retractable Printing/Coating
Unit Operable on the Plate
and Blanket Cylinders from
the Dampener Side of the
First Printing Unit

PRIORITÄTSEKLÄRUNG / DECLARATION OF PRIORITY /
DECLARATION DE PRIORITE

PRIO

01 # # #

02 # # #

03 # # #

04 # # #

Weitere Prioritätserklärungen) auf Zusatzblatt /
Additional declaration(s) of priority on additional sheet /
Autre(s) déclaration(s) de priorité sur feuille additionnelle

MIKROORGANISMEN

Die Erfindung betrifft einen Mikro-
organismus (mehrere Mikroorganis-
men) oder seine (ihre) Verwendung,
der (die) auf Grund des Budapest-
Vertrages oder eines bilateralen
Abkommens zwischen der Hinter-
legungsstelle und dem EPA nach
Regel 28(1) a) bei einer anerkannten
Hinterlegungsstelle hinterlegt worden
ist (sind), um die Bedingungen für die
Offenbarung der Erfindung gemäß
Artikel 83 in Verbindung mit
Regel 28 zu erfüllen

MICRO-ORGANISMS

The invention relates to and/or uses
(a) micro-organism(s) deposited for
the purposes of disclosure pursuant
to Article 83 in conjunction with
Rule 28 with a depositary institution
recognised within the meaning of
Rule 28(1) (a) under either the
Budapest Treaty or a bilateral
agreement between the institution
and the EPO

MICO 1 # # # # # # # #

Die Angaben nach Regel 28(1) c) sind in den technischen Anmeldungs-
unterlagen enthalten auf / The particulars referred to in Rule 28(1) (c) are
given in the technical documents in the application on / Les indications
visées à la règle 28(1) c) figurent dans les pièces techniques de la
demande à la / aux

werden später mitgeteilt / will be submitted at a later date /
seront communiquées ultérieurement

Die Empfangsbescheinigung(en) der Hinterlegungsstelle ist (sind)
beigefügt / The receipt(s) of deposit issued by the depositary institution
is (are) enclosed / Le(s) récépissé(s) de dépôt délivré(s) par l'autorité
de dépôt est (sont) ci-joint(s)

wird (werden) nachgereicht / will be filed at a later date /
sera (seront) produit(s) ultérieurement

Staat / State / Etat

Anmeldetag / Filing
date / Date de dépôtAktenzeichen / Application
No. / N° de la demande

1 US 02.10.1995 08/538,123

2

3

4

MICRO-ORGANISMES

L'invention concerne un (plusieurs)
micro-organisme(s) et/ou utilise un
(plusieurs) micro-organisme(s),
déposé(s) afin de satisfaire aux
conditions d'expose de l'invention
prevues à l'article 83 ensemble
la règle 28, à cet effet, le dépôt a été
effectué auprès d'une autorité
habilitée au sens de la règle 28(1) a),
en vertu soit du Traité de Budapest,
soit d'un accord bilatéral entre
l'autorité et l'OEB

Seite(n) / page(s)

Zeile(n) / line(s) / lignes

28

29

30

00315796 051101

**NUCLEOTID-UND AMINOSAURESEQUENZEN / NUCLEOTIDE
AND AMINO ACID SEQUENCES / SEQUENCES DE
NUCLEOTIDES ET D'ACIDES AMINES**

SEQ(1) 31

Die Beschreibung enthält ein Sequenzprotokoll nach Regel 27a(1) / The description contains a sequence listing in accordance with Rule 27a(1) / La description contient une liste de séquences selon la règle 27bis(1)

Der vorgeschriebene maschinenlesbare Datenträger ist beigelegt / The prescribed machine readable data carrier is enclosed / Le support de données prescrit déchiffirable par machine est annexé

Es wird hiermit erklärt, daß die auf dem Datenträger gespeicherte Information mit dem schriftlichen Sequenzprotokoll übereinstimmt (Regel 27a(2)) / It is hereby stated that the information recorded on the data carrier is identical to the written sequence listing (Rule 27a(2)) / Il est déclaré par la présente que l'information figurant sur le support de données est identique à celle que contient la liste de séquences écrite (règle 27bis (2))

**Verschiedene Anmelder für verschiedene Vertragsstaaten /
Different applicants for different Contracting States /
Différents demandeurs pour différents Etats contractants**

32 Name(n) des (der) Anmelder(s) und benannte Vertragsstaaten /
Name(s) of applicant(s) and designated Contracting States /
Nom(s) du (des) demandeur(s) et des Etats contractants désignés

APPR 02 #

**BENENNUNG VON VERTRAGSSTAATEN
DESIGNATION OF CONTRACTING STATES
DESIGNATION D'ETATS CONTRACTANTS**

DEST

33

Osterreich / Austria / Autriche

AT

Belgien / Belgium / Belgique

BE

Schweiz und Liechtenstein / Switzerland and
Liechtenstein / Suisse et Liechtenstein

CH / LI

Deutschland / Germany / Allemagne

DE

Danemark / Denmark / Danemark

DK

Spanien / Spain / Espagne

ES

Frankreich / France / France

FR

Vereinigtes Königreich / United Kingdom / Royaume-Uni

GB

Griechenland / Greece / Grece

GR

Irland / Ireland / Irlande

IE

Italien / Italy / Italie

IT

Luxemburg / Luxembourg / Luxembourg

LU

Monaco / Monaco / Monaco

MC

Niederlande / Netherlands / Pays-Bas

NL

Portugal / Portugal / Portugal

PT

Schweden / Sweden / Suede

SE

Finland

FI

Paatzu hier eingetragene Länder des EPU nach
Durchführung dieses Formulars in Kraft tritt

Space for Contracting States for which the EPC
enters into force after this form has been printed

**VORSORGLICHE BENENNUNG
SAMTLICHER VERTRAGSSTAATEN**

Die in Feld 33 angegebenen Staaten sind jene, für die die Zahlung der Benennungsgebühren vorgenommen wurde oder derzeit beabsichtigt ist. Vorsorglich werden jedoch sämtliche Staaten benannt, die zum Zeitpunkt der Einreichung dieser Anmeldung Vertragsstaaten des EPU sind (1.10.1995 AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, MC, NL, PT, SE). Es wird ersucht, die Benennung der hier zusätzlich benannten Vertragsstaaten als vom Anmelder zurückgenommen zu betrachten, wenn für diese Staaten die Benennungsgebühren nicht bis zum Ablauf der in Regel 85a(2) vorgesehenen Nachfrist entrichtet werden. Es wird beantragt, von der Zustellung einer Mitteilung nach Regel 85a(1) und einer Mitteilung nach Regel 69(1) betreffend die hier zusätzlich benannten Vertragsstaaten abzusehen.

**PRECAUTIONARY DESIGNATION OF
ALL CONTRACTING STATES**

The States indicated in Section 33 are those for which it is at present intended to pay designation fees if these have not already been paid. As a precautionary measure, however, all those States which are Contracting States to the EPC at the time of filing this application are designated (1.10.1995 AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, MC, NL, PT, SE). It is hereby requested that the designation of any additional States thereby included be regarded as withdrawn by the applicant if the designation fees have not been paid by the time the period of grace allowed in Rule 85a(2) expires. It is requested that no communication under Rule 85a(1) nor any communication under Rule 69(1) concerning the additional Contracting States designated above be notified.

33a

(Prévu pour des Etats contractants à l'égard desquels
la CBE entiers en vigueur après l'impression du
présent formulaire)

**DESIGNATION A TOUTES FINS UTILES
DE TOUS LES ETATS CONTRACTANTS**

Les Etats indiqués à la rubrique 33 sont ceux pour lesquels le paiement des taxes de designation a été effectué ou pour lesquels l'on se propose actuellement de payer les taxes de designation. Toutefois, à toutes fins utiles, sont désignés tous les Etats qui sont des Etats contractants de la CBE à la date du dépôt de la demande (1.10.1995 AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, MC, NL, PT, SE). Il est demandé, au cas où les taxes de designation pour les Etats contractants désignés à titre complémentaire ne seraient pas acquittées dans le délai supplémentaire prévu à la règle 85bis(2), que la désignation desdits Etats soit considérée comme retirée par le demandeur. Prière de ne pas procéder pour lesdits Etats contractants désignés à titre complémentaire à la signification d'une notification établie conformément à la règle 85bis(1) ou à la règle 69(1).

**ERSTRECKUNG DES
EUROPAISCHEN PATENTS**

Diese Anmeldung gilt als Antrag, die europäische Patentanmeldung und das darauf erteilte europäische Patent auf alle Nicht-Vertragsstaaten des EPU zu erstrecken, mit denen am Tag ihrer Einreichung „Erstreckungsabkommen“ bestehen (Derzeit: Litauen, Lettland, Slowenien).
Die Erstreckung wird jedoch nur wirksam, wenn die vorgeschriebene Erstreckungsgebühr entrichtet wird.

**EXTENSION OF THE
EUROPEAN PATENT**

This application is deemed to be a request to extend the European patent application and the European patent granted in respect of it to all non-Contracting States to the EPC with which "extension agreements" exist on the date on which the application is filed (Present situation: Lithuania, Latvia, Slovenia).
However, the extension only takes effect if the prescribed extension fee is paid.

34

**EXTENSION DES EFFETS
DU BREVET EUROPEEN**

La présente demande est réputée constituer une requête en extension des effets de la demande de brevet européen et du brevet européen délivré sur la base de cette demande à tous les États non parties à la CBE avec lesquels il existe un «accord d'extension» à la date du dépôt de la demande (Situation actuelle: Lituanie, Lettonie, Slovénie).
Toutefois l'extension ne produit ses effets que s'il est acquitté la taxe d'extension prescrite.

EXPT

Der Anmelder beabsichtigt derzeit, die Erstreckungsgebühr für die nachfolgend angekreuzten Staaten zu entrichten: /
The applicant currently intends to pay the extension fee for the States marked below with a cross: /
Le demandeur se propose actuellement d'acquitter la taxe d'extension pour les États dont le nom est coché ci-après:

Litauen / Lithuania / Lituanie

LT

Lettland / Latvia / Lettonie

LV

Slowenien / Slovenia / Slovénie

SI

Patent States in which extension agreements exist, to be filled in by the applicant /
States in which extension agreements exist, to be filled in by the applicant /
Patent États à l'égard desquels des accords d'extension existent, à remplir par le demandeur

Die Anmeldung ist eine Teilanmeldung /
The application is a divisional application /
La présente demande constitue une demande divisionnaire

DFIL 9

#

PANR

#

35

Nummer der früheren Anmeldung
No. of earlier application
Numero de la demande initiale

Es handelt sich um eine Anmeldung nach Art. 61(1)(b) /
The application is an Art. 61(1)(b) application / La présente demande constitue une demande selon l'article 61(1)(b)

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EANR

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36

Nummer der früheren Anmeldung
No. of earlier application
Numero de la demande initiale

Patentansprüche / Claims / Revendications

CLMS

37

16

Zahl der Patentansprüche
Number of claims
Nombre de revendications

Weiterer Satz von Patentansprüchen (Art. 167(2)(a)) /
Additional set of claims (Art. 167(2)(a)) /
Série supplémentaire de revendications (art. 167(2)(a))

AUCL (1)

AUCL (3)

AUCL (4)

38

AT
ES
GR

Zahl der Patentansprüche
Number of claims
Nombre de revendications

Zur Veröffentlichung mit der Zusammenfassung wird vorgeschlagen
Abbildung Nr. / With the abstract it is proposed to publish
figure No. / Il est proposé de publier avec l'abrégé
la figure n°

DRAW (2)

39

1

Nummer / Number / Numero

Zusätzliche Abschrift(en) der im europäischen Recherchenbericht
angeführten Schriftstücke wird (werden) beantragt / Additional copy(ies)
of the documents cited in the European search report is (are) requested /
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ASOC

40

1

Anzahl der **zusätzlichen** Sätze von Abs.:
Number of **additional** sets of copies
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Es wird die Rückerstattung der Recherchegebühr gemäß Art. 10 GebO beantragt / Refund of the search fee is requested pursuant to Article 10 of the Rules relating to Fees / Le remboursement de la taxe de recherche est demandé en vertu de l'article 10 du règlement relatif aux taxes

41

Eine Kopie des Recherchenberichts ist beigelegt / A copy of the search report is attached / Une copie du rapport de recherche est jointe

42

AUTOMATISCHER ABBUCHUNGSauftrag (nur möglich für Inhaber von beim EPA geführten laufenden Konten)

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ORDRE DE PRELEVEMENT AUTOMATIQUE (uniquement possible pour les titulaires de comptes courants ouverts auprès de l'OEB)

Das Europäische Patentamt wird hiermit beauftragt, fällig werdende Gebühren und Auslagen nach Maßgabe der Vorschriften über das automatische Abbuchungsverfahren vom nebenstehenden laufenden Konto abzubuchen / The European Patent Office is hereby authorised, under the Arrangements for the automatic debiting procedure, to debit from the deposit account opposite any fees and costs falling due / Par la présente, il est demandé à l'Office européen des brevets de prélever du compte courant ci-contre les taxes et frais venant à échéance, conformément à la réglementation relative au prélèvement automatique

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43

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UEXKÜLL & STOLBERG

Die vorgeschriebene Liste über die diesem Antrag beigelegten Unterlagen ergibt sich aus der vorbereiteten Empfangsbescheinigung (Seite 6 dieses Antrages)

The prescribed list of documents enclosed with this request is shown on the prepared receipt (page 6 of this request)

45

La liste prescrite des documents joints à cette requête figure sur le récépissé préétabli (page 6 de la présente requête)

Unterschrift(en) des (der) Anmelders(s) oder Vertreter(s) /
Signature(s) of applicant(s) or representative(s) /
Signature(s) du (des) demandeur(s) ou du (des) mandataire(s)

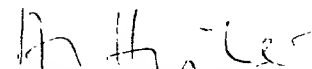
46

Für Angestellte nach Artikel 133 (3) Satz 1 mit allgemeiner Vollmacht / For employees under Article 133 (3), 1st sentence, having a general authorisation / Pour les employés mentionnés à l'article 133, paragraphe 3, 1re phrase, munis d'un pouvoir général Nr. / No. / n°

Ort / Place / Lieu **Hamburg**

Datum / Date **1. 10. 1996**

UEXKÜLL & STOLBERG
(Association No. 1)


Arnulf Huber

Name des (der) Unterzeichneten bitte mit Schreibmaschine wiedergeben. Bei juristischen Personen bitte die Stellung des (der) Unterzeichneten innerhalb der Gesellschaft mit Schreibmaschine angeben. / Please type name under signature. In case of legal persons, the position of the signatory within the company should also be typed. / Le ou les noms des signataires doivent être également dactylographiés. S'il s'agit d'une personne morale, la position occupée au sein de celle-ci par le ou les signataires sera indiquée à la machine à écrire.

Empfangsbescheinigung / Receipt for documents / Récépissé de documents 6

(Liste der diesem Antrag be beigefügten Unterlagen)

(Checklist of enclosed documents)

(Liste des documents annexes à la présente requête)

Es wird hiermit der Empfang der unten bezeichneten Dokumente bescheinigt / Receipt of the documents indicated below is hereby acknowledged / Nous attestons le dépôt des documents désignés ci-dessous

Wird im Falle der Einreichung der europäischen Patentanmeldung bei einer nationalen Behörde diese Empfangsbescheinigung vom Europäischen Patentamt übersandt, so ist sie als Mitteilung gemäß Regel 24(4) anzusehen (siehe Feld RENA). Nach Erhalt der Mitteilung nach Regel 24(4) sind alle weiteren Unterlagen, die die Anmeldung betreffen, nur noch unmittelbar beim EPA einzureichen. / If this receipt is issued by the European Patent Office and the European patent application was filed with a national authority it serves as a communication under Rule 24(4) (see Section RENA). Once the communication under Rule 24(4) has been received, all further documents relating to the application must be sent directly to the European Patent Office. / Si, en cas de dépôt de la demande de brevet européen auprès d'un service national, le présent récépissé est réputé être la notification visée à la règle 24(4). Des que la notification visée à la règle 24(4) a été reçue, tous les autres documents relatifs à la demande doivent être adressés directement à l'OEB.

UEXKÜLL & STOLBERG
Patentanwälte
Beselerstr. 4

D-22607 Hamburg

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Datum / Date: 02.10.1996

Europäisches Patentamt
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D-10995 Berlin

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| | | |
|--|-------------|------------|
| Anmeldenummer / Application No. / N° de la demande | 1.390.010.1 | |
| Tag des Eingangs (Regel 24(2)) / Date of receipt (Rule 24(2)) / Date de réception (règle 24(2)) | DREC | 02.10.1996 |
| Zeichen des Anmelders/Vertreter / Applicant's/Representative's ref. / Reference du demandeur ou du mandataire | AREF | P 44213 |
| Nur nach Einreichung der Anmeldung bei einer nationalen Behörde / Only after filing of the application with a national authority / Seulement après le dépôt de la demande auprès d'un service national | | |
| Tag des Eingangs beim EPA (Regel 24(4)) / Date of receipt at EPO (Rule 24(4)) / Date de réception à l'OEB (règle 24(4)) | RENA | |

| A. Anmeldeunterlagen und Prioritätsbeleg(e) / Application documents and priority document(s) / Pièces de la demande et document(s) de priorité | 47 | Stückzahl / Number of copies / Nombre d'exemplaire | Blattzahl* eines Stücks / Number of sheets* in each copy / Nombre de "feuilles" par exemplaire | Gesamtzahl der Abbildungen / Total number of figures / Nombre total de figures |
|--|----------|--|--|--|
| 1. Beschreibung / Description | | 31 | 35 | |
| 2. Patentansprüche / Claims / Revendications | | 31 | 67 | |
| 3. Ggf. unterschiedliche Patentansprüche (Art. 167(2) a)) / Any different claims (Art. 167(2) a)) / Le cas échéant, revendications différentes (art. 167(2) a)) | | | | |
| 4. Zeichnung(en) / Drawings(s) / Dessins | DRAW 1 # | 31 | 10 | 18 |
| 5. Zusammenfassung / Abstract / Abrégé | | 31 | 1 | |
| 6. Übersetzung der Anmeldeunterlagen / Translation of the application documents / Traduction des pièces de la demande | | | | |
| 7. Prioritätsbeleg(e) / Priority document(s) / Document(s) de priorité | | | | |
| B. Der Anmeldung in der eingereichten Fassung liegen folgende Unterlagen bei: / This application as filed is accompanied by the items below: / A la présente demande sont annexées les pièces suivantes: | | | | |
| 1. Einzelvollmacht / Specific authorisation / Pouvoir particulier | | | | |
| 2. Allgemeine Vollmacht / General authorisation / Pouvoir général | | | | |
| 3. Erfindernennung / Designation of inventor / Désignation de l'inventeur | | | | |
| 4. Früherer Recherchebericht / Earlier search report / Rapport de recherche antérieure | | | | |
| 5. Gebührenzahlungsvordruck (EPA Form 1010) / Voucher for the settlement of fees (EPO Form 1010) / Bordereau de règlement de taxes (OEB Form 1010) | | | | |
| 6. Scheck (ausgeschlossen bei Einreichung bei den nationalen Behörden) / Cheque (not when filing with national authorities) / Chèque (pas de chèque en cas de dépôt auprès des services nationaux) | | | | |
| 7. Datenträger für Sequenzprotokoll / Data carrier for sequence listing / Support de données pour liste de séquences | SEQL (4) | | | |
| 8. Zusatzblatt / Additional sheet / Feuille additionnelle | | | | |
| 9. Sonstige Unterlagen (bitte hier spezifizieren) / Other (please specify here) / Autres documents (veuillez préciser ici) | | | | |
| C. Kopien dieser Empfangsbescheinigung / Copies of this receipt for documents / Copies du présent récépissé de documents | | | | |
| | 49 | 2 | Anzahl der Kopien / Number of copies / Nombre de copies | |

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P 44213

Raum für Zeichen des Anmelders / Space for applicant's reference / Espace réservé à la référence du demandeur

Nr. der Anmeldung / Application N° / N° de la demande

Zeichen des Vertreters
Representative's Reference
Référence du mandataire

P 44213

In Sachen der Europäischen Patentanmeldung (*Bezeichnung der Erfindung*)
In respect of the European patent application (*title of the invention*)
En ce qui concerne la demande de brevet européen (Titre de l'invention)

Retractable Printing/Coating Unit Operable on the Plate and
Blanket Cylinders from the Dampener Side of the First Printing
Unit

nennen die Unterzeichneten
We, the undersigned
les soussignés

UEXKÜLL & STOLBERG
Patentanwälte
Beselerstr. 4
D-22607 HAMBURG

Zusammenschluß Nr. 1 / Association No. 1 / Groupement No. 1

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do hereby designate as inventor(s):
désigne(nt) en tant qu'inventeur(s):

1. DeMoore, Howard
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(Weitere Erfinder sind auf einem gesonderten Blatt angegeben)
☐ (Additional inventors indicated on supplementary sheet)
(les autres inventeurs sont mentionnés sur une feuille supplémentaire)

Erklärung darüber, wie der (die) Anmelder das Recht auf das Europäische Patent erlangt hat (haben):
Statement indicating the origin of right to the European patent:
Déclaration indiquant l'origine de l'acquisition du droit au brevet:


Assignment dated 15.03.1996

Ort / Place / Lieu **HAMBURG**

Datum / Date **28. 9. 1996**

Unterschrift des Vertreters
Signature of Representative
Signature du mandataire

UEXKÜLL & STOLBERG


Arhulf Huber

Zusammenschluß Nr. 1 / Association No. 1 / Groupement N° 1

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Field of the Invention

1 This invention relates generally to sheet-fed or web-
2 fed, rotary offset lithographic printing presses, and more
3 particularly, to a new and improved inking/coating apparatus for
4 the in-line application of aqueous or flexographic printing inks,
5 primer or protective/decorative coatings applied simultaneously to
6 the plate and blanket of the first or any consecutive printing
7 unit of any lithographic printing press.

Background of the Invention

9 Conventional sheet-fed, rotary offset printing presses
10 typically include one or more printing units through which
11 individual sheets are fed and printed. After the last printing
12 unit, freshly printed sheets are transferred by a delivery
13 conveyor to the delivery end of the press where the freshly
14 printed and/or coated sheets are collected and stacked uniformly.
15 In a typical sheet-fed, rotary offset printing press such as the
16 Heidelberg Speedmaster line of presses, the delivery conveyor
17 includes a pair of endless chains carrying gripper bars with

gripper fingers which grip and pull freshly printed sheets from the last impression cylinder and convey the sheets to the sheet delivery stacker.

Since the inks used with sheet fed rotary offset printing presses are typically wet and tacky, special precautions must be taken to prevent marking and smearing of the freshly printed or coated sheets as the sheets are transferred from one printing unit to another. The printed ink on the surface of the sheet dries relatively slowly and is easily smeared during subsequent transfer between printing units. Marking, smearing and smudging can be prevented by a vacuum assisted sheet transfer apparatus as described in the following U.S. Patents: 5,113,255; 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W. DeMoore, co-inventor, and manufactured and sold by Printing Research, Inc. of Dallas, Texas, U.S.A. under its trademark BACVAC™.

In some printing jobs, offsetting is prevented by applying a protective and/or decorative coating material over all or a portion of the freshly printed sheets. Some coatings are formed of a UV-curable or water-dispersed resin applied as a liquid solution over the freshly printed sheets to protect the ink from offsetting or set-off and improve the appearance of the freshly printed sheets. Such coatings are particularly desirable when decorative or protective finishes are applied in the printing of posters, record jackets, brochures, magazines, folding cartons and the like.

Description of the Prior Art

Various arrangements have been made for applying the coating as an in-line printing operation by using the last printing unit of the press as the coating application unit. For example, U.S. Patents 4,270,483; 4,685,414; and 4,779,557 disclose coating apparatus which can be moved into position to permit the blanket cylinder of the last printing unit of a printing press to be used to apply a coating material over the freshly printed

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1 sheet. In U.S. Patent 4,841,903 (Bird) there are disclosed
2 coating apparatus which can be selectively moved between the plate
3 cylinder or the blanket cylinder of the last printing unit of the
4 press so the last printing unit can only be used for coating
5 purposes. However, when coating apparatus of these types are
6 being used, the last printing unit cannot be used to print ink to
7 the sheets, but rather can only be used for the coating operation.
8 Thus, while coating with this type of in-line coating apparatus,
9 the printing press loses the capability of printing on the last
10 printing unit as it is converted to a coating unit.

11 The coater of U.S. Patent 5,107,790 (Sliker et al) is
12 retractable along an inclined rail for extending and retracting a
13 coater head into engagement with a blanket on the blanket
14 cylinder. Because of its size, the rail-retractable coater can
15 only be installed between the last printing unit of the press and
16 the delivery sheet stacker, and cannot be used for interunit
17 coating. The coater of U.S. Patent 4,615,293 (Jahn) provides two
18 separate, independent coaters located on the dampener side of a
19 converted printing unit for applying lacquer to a plate and to a
20 rubber blanket. Consequently, although a plate and blanket are
21 provided, the coating unit of Jahn's press is restricted to a
22 dedicated coating operation only.

23 Proposals have been made for overcoming the loss of a
24 printing unit when in-line coating is used, for example as set
25 forth in U.S. Patent 5,176,077 to Howard W. DeMoore (co-inventor
26 and assignee), which discloses a coating apparatus having an
27 applicator roller positioned to apply the coating material to the
28 freshly printed sheet while the sheet is still on the last
29 impression cylinder of the press. This allows the last printing
30 unit to print and coat simultaneously, so that no loss of printing
31 unit capability results.

32 Some conventional coaters are rail-mounted and occupy a
33 large amount of press space and reduce access to the press.
34 Elaborate equipment is needed for retracting such coaters from the

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1 operative coating position to the inoperative position, which
2 reduces access to the printing unit.

3 Accordingly, there is a need for an in-line ink-
4 inking/coating apparatus which does not result in the loss of a
5 printing unit, does not extend the length of the press, and which
6 can print and coat aqueous and flexographic inks and coating
7 materials simultaneously onto the plate and blanket on any litho-
8 graphic printing unit of any lithographic printing press,
9 including the first printing unit.

10 Objects of the Invention

11 Accordingly, a general object of the present invention
12 is to provide improved inking/coating apparatus which is capable
13 of selectively applying ink or coating material to a plate on a
14 plate cylinder or ink or coating material to a plate or blanket on
15 a blanket cylinder.

16 A specific object of the present invention is to provide
17 improved inking/coating apparatus of the character described which
18 is extendable into inking/coating engagement with either a plate
19 on a plate cylinder or to a plate or blanket on a blanket
20 cylinder.

21 A related object of the present invention is to provide
22 improved inking/coating apparatus of the character described which
23 is capable of being mounted on any lithographic printing unit of
24 the press and does not interfere with operator access to the plate
25 cylinder, blanket cylinder, or adjacent printing units.

26 Another object of the present invention is to provide
27 improved inking/coating apparatus of the character described,
28 which can be moved from an operative inking/coating engagement
29 position adjacent to a plate cylinder or a blanket cylinder to a
30 non-operative, retracted position.

31 Still another object of the present invention is to
32 provide improved inking/coating apparatus of the character
33 described, which can be used for applying aqueous, flexographic
34 and ultra-violet curable inks and/or coatings in combination with

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1 lithographic, flexographic and waterless printing processes on any
2 rotary offset printing press.

3 A related object of the present invention is to provide
4 improved inking/coating apparatus of the character described,
5 which is capable of applying aqueous or flexographic ink or
6 coating material on one printing unit, for example the first
7 printing unit, and drying the ink or coating material before it is
8 printed or coated on the next printing unit so that it can be
9 overprinted or overcoated immediately on the next printing unit
10 with waterless, aqueous, flexographic or lithographic inks or
11 coating materials.

12 Yet another object of the present invention is to
13 provide improved inking/coating apparatus for use on a multiple
14 color rotary offset printing press that can apply ink or coating
15 material separately and/or simultaneously to the plate and/or
16 blanket of a printing unit of the press from a single operative
17 position, and from a single inking/coating apparatus.

18 A related object of the present invention is to provide
19 improved inking/coating apparatus of the character described, in
20 which virtually no printing unit adjustment or alteration is
21 required when the inking/coating apparatus is converted from plate
22 to blanket printing or coating and vice versa.

23 Another object of the present invention is to provide
24 improved inking/coating apparatus that can be operably mounted in
25 the dampener space of any lithographic printing unit for ink-
26 ing/coating engagement with either a plate on a plate cylinder or
27 a plate or blanket on a blanket cylinder, and which does not
28 interfere with operator movement or activities in the interunit
29 space between printing units.

30 Summary of the Invention

31 The foregoing objects are achieved by a retractable, in-
32 line inking/coating apparatus which is mounted on the dampener
33 side of any printing unit of a rotary offset press for movement
34 between an operative (on-impression) inking/coating position and

1 a retracted, disengaged (off-impression) position. The ink-
2 ing/coating apparatus includes an applicator roller which is
3 movable into and out of engagement with a plate on a plate
4 cylinder or a blanket on a blanket cylinder. The inking/coating
5 applicator head is pivotally coupled to a printing unit by pivot
6 pins which are mounted on the press side frames in the traditional
7 dampener space of the printing unit in parallel alignment with the
8 plate cylinder and the blanket cylinder. This dampener space
9 mounting arrangement allows the inking/coating unit to be
10 installed between any adjacent printing units on the press.

11 In the preferred embodiment, the applicator head
12 includes vertically spaced pairs of cradle members with one cradle
13 pair being adapted for supporting an inking/coating applicator
14 roller in alignment with a plate cylinder, and the other cradle
15 pair supporting an inking/coating applicator roller in alignment
16 with the blanket cylinder, respectively, when the applicator head
17 is in the operative position. Because of the pivotal support
18 provided by the pivot pins, the applicator head can be extended
19 and retracted within the limited space available in the tradition-
20 al dampener space, without restricting operator access to the
21 printing unit cylinders and without causing a printing unit to
22 lose its printing capability.

23 When the inking/coating apparatus is used in combination
24 with a flexographic printing plate and aqueous or flexographic ink
25 or coating material, the water component of the aqueous or
26 flexographic ink or coating material on the freshly printed or
27 coated sheet is evaporated and dried by a high velocity, hot air
28 interunit dryer and a high volume heat and moisture extractor
29 assembly so that the freshly printed ink or coating material is
30 dry before the sheet is printed or coated on the next printing
31 unit. This quick drying process permits a base layer or film of
32 ink, for example opaque white or metallic (gold, silver or other
33 metallics) ink to be printed on the first printing unit, and then
34 overprinted on the next printing unit without back-trapping or dot
35 gain.

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1 The construction and operation of the present invention
2 will be understood from the following detailed description taken
3 in conjunction with the accompanying drawings which disclose, by
4 way of example, the principles and advantages of the present
5 invention.

6 Brief Description of the Drawings

7 FIGURE 1 is a perspective view of a sheet fed, rotary
8 offset printing press having inking/coating apparatus embodying
9 the present invention;

10 FIGURE 2 is a simplified perspective view of the single
11 head, dual cradle inking/coating apparatus of the present
12 invention;

13 FIGURE 3 is a schematic side elevational view of the
14 printing press of Figure 1 having single head, dual cradle ink-
15 ing/coating apparatus installed in the traditional dampener
16 position of the first, second and last printing units;

17 FIGURE 4 is a simplified side elevational view showing
18 the single head, dual cradle inking/coating apparatus in the
19 operative inking/coating position for simultaneously printing on
20 the printing plate and blanket on the fourth printing unit;

21 FIGURE 5 is a simplified side elevational view showing
22 the single head, dual cradle inking/coating apparatus in the
23 operative position for spot or overall inking or coating on the
24 blanket of the first printing unit, and showing the dual cradle
25 inking/coating apparatus in the operative position for spot or
26 overall inking or coating on the printing plate of the second
27 printing unit;

28 FIGURE 6 is a simplified side elevational view of the
29 single head, dual cradle inking/coating apparatus of FIGURE 4 and
30 FIGURE 5, partially broken away, showing the single head, dual
31 cradle inking/coating apparatus in the operative coating position
32 and having a sealed doctor blade reservoir assembly for spot or
33 overall coating on the blanket;

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1 FIGURE 7 is a schematic view showing a heat exchanger
2 and pump assembly connected to the single head, dual cradle
3 inking/coating apparatus for circulating temperature controlled
4 ink or coating material to the inking/coating apparatus;

5 FIGURE 8 is a side elevational view, partially broken
6 away, and similar to FIGURE 6 which illustrates an alternative
7 coating head arrangement;

8 FIGURE 9 is a simplified elevational view of a printing
9 unit which illustrates pivotal coupling of the inking/coating
10 apparatus on the printing unit side frame members;

11 FIGURE 10 is a view similar to FIGURE 2 in which a pair
12 of split applicator rollers are mounted in the upper cradle and
13 lower cradle, respectively;

14 FIGURE 11 is a side elevational view of a split applica-
15 tor roller;

16 FIGURE 12 is a perspective view of a doctor blade
17 reservoir which is centrally partitioned by a seal element;

18 FIGURE 13 is a sectional view showing sealing engagement
19 of the split applicator roller against the partition seal element
20 of FIGURE 12;

21 FIGURE 14 is a view similar to FIGURE 8 which illus-
22 trates an alternative inking/coating embodiment;

23 FIGURE 15 is a simplified side elevational view of a
24 substrate which has a bronzed-like finish which is applied by
25 simultaneous operation of the dual applicator roller embodiment of
26 FIGURE 14;

27 FIGURE 16 is a side elevational view, partly in section,
28 of a pan roller having separate transfer surfaces mounted on a
29 split fountain pan;

30 FIGURE 17 is a simplified side elevational view of the
31 dual cradle inking/coating apparatus, partially broken away, which
32 illustrates an alternative inking/coating head apparatus featuring
33 a single doctor blade assembly, anilox applicator roller mounted
34 on the lower cradle; and

1 FIGURE 18 is a side elevational view, partly in section,
2 of a single doctor blade anilox applicator roller assembly having
3 separate transfer surfaces, and a split fountain pan having
4 separate fountain compartments, with the separate fountain
5 compartments being supplied with different inks or coating
6 materials from separate off-press sources.

7 Detailed Description of the Preferred Embodiments

8 As used herein, the term "processed" refers to printing
9 and coating methods which can be applied to either side of a
10 substrate, including the application of lithographic, waterless,
11 UV-curable, aqueous and flexographic inks and/or coatings. The
12 term "substrate" refers to sheet and web material. Also, as used
13 herein, the term "waterless printing plate" refers to a printing
14 plate having image areas and non-image areas which are oleophilic
15 and oleophobic, respectively. "Waterless printing ink" refers to
16 an oil-based ink which does not contain a significant aqueous
17 component. "Flexographic plate" refers to a flexible printing
18 plate having a relief surface which is wettable by flexographic
19 ink or coating material. "Flexographic printing ink or coating
20 material" refers to an ink or coating material having a base
21 constituent of either water, solvent or UV-curable liquid. "UV-
22 curable lithographic printing ink and coating material" refers to
23 oil-based printing inks and coating materials that can be cured
24 (dried) photomechanically by exposure to ultraviolet radiation,
25 and that have a semi-paste or gel-like consistency. "Aqueous
26 printing ink or coating material" refers to an ink or coating
27 material that predominantly contains water as a solvent, diluent
28 or vehicle. A "relief plate" refers to a printing plate having
29 image areas which are raised relative to non-image areas which are
30 recessed.

31 As shown in the exemplary drawings, the present
32 invention is embodied in a new and improved in-line inking/coating
33 apparatus, herein generally designated 10, for applying aqueous,
34 flexographic or UV-curable inks or protective and/or decorative

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1 coatings to sheets or webs printed in a sheet-fed or web-fed,
2 rotary offset printing press, herein generally designated 12. In
3 this instance, as shown in FIGURE 1, the inking/coating apparatus
4 10 is installed in a four unit rotary offset printing press 12,
5 such as that manufactured by Heidelberger Druckmaschinen AG of
6 Germany under its designation Heidelberg Speedmaster SM102 (40",
7 102cm).

8 The press 12 includes a press frame 14 coupled at one
9 end, herein the right end, to a sheet feeder 16 from which sheets,
10 herein designated S, are individually and sequentially fed into
11 the press, and at the opposite end, with a sheet delivery stacker
12 20 in which the freshly printed sheets are collected and stacked.
13 Interposed between the sheet feeder 16 and the sheet delivery
14 stacker 20 are four substantially identical sheet printing units
15 22, 24, 26 and 28 which can print four different colors onto the
16 sheets as they are transferred through the press 12. The printing
17 units are housed within printing towers T1, T2, T3 and T4 formed
18 by side frame members 14, 15. Each printing tower has a delivery
19 side 25 and a dampener side 27. A dampener space 29 is partially
20 enclosed by the side frames on the dampener side of the printing
21 unit.

22 As illustrated, the printing units 22, 24, 26 and 28 are
23 substantially identical and of conventional design. The first
24 printing unit 22 includes an in-feed transfer cylinder 30, a plate
25 cylinder 32, a blanket cylinder 34 and an impression cylinder 36,
26 all supported for rotation in parallel alignment between the press
27 side frames 14, 15 which define printing unit towers T1, T2, T3
28 and T4. Each of the first three printing units 22, 24 and 26 have
29 a transfer cylinder 38 disposed to transfer the freshly printed
30 sheets from the adjacent impression cylinder and transfer the
31 freshly printed sheets to the next printing unit via an intermedi-
32 ate transfer drum 40.

33 The last printing unit 28 includes a delivery cylinder
34 42 mounted on a delivery shaft 43. The delivery cylinder 42
35 supports the freshly printed sheet 18 as it is transferred from

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1 the last impression cylinder 36 to a delivery conveyor system,
2 generally designated 44, which transfers the freshly printed sheet
3 to the sheet delivery stacker 20. To prevent smearing during
4 transfer, a flexible covering is mounted on the delivery cylinder
5 42, as described and claimed in U.S. Patent 4,402,267 to Howard W.
6 DeMoore, which is incorporated herein by reference. The flexible
7 covering is manufactured and sold by Printing Research, Inc. of
8 Dallas, Texas, U.S.A., under its trademark SUPER BLUE®. Optional-
9 ly, a vacuum-assisted sheet transfer assembly manufactured and
10 sold by Printing Research, Inc. of Dallas, Texas, U.S.A., under
11 its trademark BACVAC® can be substituted for the delivery transfer
12 cylinder 42 and flexible covering.

13 The delivery conveyor system 44 as shown in FIGURE 2 is
14 of conventional design and includes a pair of endless delivery
15 gripper chains 46, only one of which is shown carrying at regular
16 spaced locations along the chains, laterally disposed gripper bars
17 having gripper fingers used to grip the leading edge of a freshly
18 printed or coated sheet 18 after it leaves the nip between the
19 impression cylinder 36 and delivery cylinder 42 of the last
20 printing unit 28. As the leading edge is gripped by the gripper
21 fingers, the delivery chains 46 pull the sheet away from the last
22 impression cylinder 36 and convey the freshly printed or coated
23 sheet to the sheet delivery stacker 20.

24 Prior to reaching the delivery sheet stacker, the
25 freshly printed and/or coated sheets S pass under a delivery dryer
26 48 which includes a combination of infra-red thermal radiation,
27 high velocity hot air flow and a high performance heat and
28 moisture extractor for drying the ink and/or the protec-
29 tive/decorative coating. Preferably, the delivery dryer 48,
30 including the high performance heat and moisture extractor is
31 constructed as described in U.S. Application Serial Number
32 08/116,711, filed September 3, 1993, entitled "Infra-Red Forced
33 Air Dryer and Extractor" by Howard C. Secor, Ronald M. Rendleman
34 and Paul D. Copenhaver, commonly assigned to the assignee of the
35 present invention, Howard W. DeMoore, and licensed to Printing

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1 Research, Inc. of Dallas, Texas, U.S.A., which manufactures and
2 markets the delivery dryer 48 under its trademark AIR BLANKET™.

3 In the exemplary embodiment shown in FIGURE 3, the first
4 printing unit 22 has a flexographic printing plate PF mounted on
5 the plate cylinder, and therefore neither an inking roller train
6 nor a dampening system is required. A flexographic printing plate
7 PF is also mounted on the plate cylinder of the second printing
8 unit 24. The form rollers of the inking roller train 52 shown
9 mounted on the second printing unit 24 are retracted and locked
10 off to prevent plate contact. Flexographic ink is supplied to the
11 flexographic plate PF of the second printing unit 24 by the ink-
12 ing/coating apparatus 10.

13 A suitable flexographic printing plate PF is offered by
14 E.I. du Pont de Nemours of Wilmington, Delaware, U.S.A., under its
15 trademark CYREL®. Another source is BASF Aktiengesellschaft of
16 Ludwigshafen, Germany, which offers a suitable flexographic
17 printing plate under its trademark NYLOFLEX®.

18 The third printing unit 26 as illustrated in FIGURE 3
19 and FIGURE 4 is equipped for lithographic printing and includes an
20 inking apparatus 50 having an inking roller train 52 arranged to
21 transfer ink Q from an ink fountain 54 to a lithographic plate P
22 mounted on the plate cylinder 32. This is accomplished by a
23 fountain roller 56 and a ductor roller 57. The fountain roller 56
24 projects into the ink fountain 54, whereupon its surface picks up
25 ink. The lithographic printing ink Q is transferred from the
26 fountain roller 56 to the inking roller train 52 by the ductor
27 roller 57. The inking roller train 52 supplies ink Q to the image
28 areas of the lithographic printing plate P.

29 The lithographic printing ink Q is transferred from the
30 lithographic printing plate P to an ink receptive blanket B which
31 is mounted on the blanket cylinder 34. The inked image carried on
32 the blanket B is transferred to a substrate S as the substrate is
33 transferred through the nip between the blanket cylinder 34 and
34 the impression cylinder 36.

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1 The inking roller arrangement 52 illustrated in FIGURE
2 3 and FIGURE 4 is exemplary for use in combination with litho-
3 graphic ink printing plates P. It is understood that a dampening
4 system 58 having a dampening fluid reservoir DF is coupled to the
5 inking roller train 52 (FIGURE 4), but is not required for water-
6 less or flexographic printing.

7 The plate cylinder 32 of printing unit 28 is equipped
8 with a waterless printing plate PW. Waterless printing plates are
9 also referred to as dry planographic printing plates and are
10 disclosed in the following U.S. patents: 3,910,187; Re. 30,670;
11 4,086,093; and 4,853,313. Suitable waterless printing plates can
12 be obtained from Toray Industries, Inc. of Tokyo, Japan. A
13 dampening system is not used for waterless printing, and waterless
14 (oil-based) printing ink is used. The waterless printing plate PW
15 has image areas and non-image areas which are oleophilic/hydro-
16 philic and oleophobic/hydrophobic, respectively. The waterless
17 printing plate PW is engraved or etched, with the image areas
18 being recessed with respect to the non-image areas. The image
19 area of the waterless printing plate PW is rolled-up with the
20 flexographic or aqueous printing ink which is transferred by the
21 applicator roller 66. Both aqueous and oil-based inks and
22 coatings are repelled from the non-image areas, and are retained
23 in the image areas. The printing ink or coating is then trans-
24 ferred from the image areas to an ink or coating receptive blanket
25 B and is printed or coated onto a substrate S.

26 For some printing jobs, a flexographic plate PF or a
27 waterless printing plate PW is mounted over a resilient packing
28 such as the blanket B on the blanket cylinder 34, for example as
29 indicated by phantom lines in printing unit 22 of FIGURE 5. An
30 advantage of this alternative embodiment is that the waterless
31 plate PW or the flexographic plate PF are resiliently supported
32 over the blanket cylinder by the underlying blanket B or other
33 resilient packing. The radial deflection and give of the
34 resilient blanket B provides uniform, positive engagement between

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1 the applicator roller 66 and a flexographic plate or waterless
2 plate.

3 In that arrangement, a plate is not mounted on the plate
4 cylinder 32; instead, a waterless plate PW is mounted on the
5 blanket cylinder, and the inked image on the waterless printing
6 plate is not offset but is instead transferred directly from the
7 waterless printing plate PW to the substrate S. The water
8 component of flexographic ink on the freshly printed sheet is
9 evaporated by high velocity, hot air dryers and high volume heat
10 and moisture extractors so that the freshly printed aqueous or
11 flexographic ink is dried before the substrate is printed on the
12 next printing unit.

13 Referring now to FIGURE 2, FIGURE 3 and FIGURE 9, the
14 inking/coating apparatus 10 is pivotally mounted on the side
15 frames 14, 15 for rotation about an axis X. The inking/coating
16 apparatus 10 includes a frame 60, a hydraulic motor 62, a lower
17 gear train 64, an upper gear train 65, an applicator roller 66, a
18 sealed doctor blade assembly 68 (FIGURE 6), and a drip pan DP, all
19 mounted on the frame 60. The external peripheral surface of the
20 applicator roller 66 is wetted by contact with liquid coating
21 material or ink contained in a reservoir 70.

22 The hydraulic motor 62 drives the applicator roller 66
23 synchronously with the plate cylinder 32 and the blanket cylinder
24 34 in response to an RPM control signal from the press drive (not
25 illustrated) and a feedback signal developed by a tachometer 72.
26 While a hydraulic drive motor is preferred, other drive means such
27 as an electric drive motor or an equivalent can be used.

28 When using waterless printing plate systems, the
29 temperature of the waterless printing ink and of the waterless
30 printing plate must be closely controlled for good image reproduc-
31 tion. For example, for waterless offset printing with TORAY
32 waterless printing plates PW, it is absolutely necessary to
33 control the waterless printing plate surface and waterless ink
34 temperature to a very narrow range, for example 24°C (75°F) to
35 27°C (80°F).

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1 Referring to FIGURE 7, the reservoir 70 is supplied with
2 ink or coating which is temperature controlled by a heat exchanger
3 71. The temperature controlled ink or coating material is
4 circulated by a positive displacement pump, for example a
5 peristaltic pump, through the reservoir 70 and heat exchanger 71
6 from a source 73 through a supply conduit 75 and a return conduit
7 77. The heat exchanger 71 cools or heats the ink or coating
8 material and maintains the ink or coating and the printing plate
9 within the desired narrow temperature range.

10 According to one aspect of the present invention,
11 aqueous/flexographic ink or coating material is supplied to the
12 applicator roller 66, which transfers the aqueous/flexographic ink
13 or coating material to the printing plate (FIGURE 7), which may be
14 a waterless printing plate or a flexographic printing plate. When
15 the inking/coating apparatus is used for applying aqueous/flexo-
16 graphic ink or coating material to a waterless printing plate PW,
17 the inking roller train 52 is not required, and is retracted away
18 from the printing plate. Because the viscosity of aqueous/flexo-
19 graphic printing ink or coating material varies with temperature,
20 it is necessary to heat or cool the aqueous/flexographic printing
21 ink or coating material to compensate for ambient temperature
22 variations to maintain the ink viscosity in a preferred operating
23 range.

24 For example, the temperature of the printing press can
25 vary from around 60°F (15°C) in the morning, to around 85°F (29°C)
26 or more in the afternoon. The viscosity of aqueous/flexographic
27 printing ink or coating material can be marginally high when the
28 ambient temperature of the press is near 60°F (15°C), and the
29 viscosity can be marginally low when the ambient temperature of
30 the press exceeds 85°F (29°C). Consequently, it is desirable to
31 control the temperature of the aqueous/flexographic printing ink
32 or coating material so that it will maintain the surface tempera-
33 ture of waterless printing plates within the specified temperature
34 range. Moreover, the ink/coating material temperature should be
35 controlled to maintain the tack of the aqueous/flexographic

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1 printing ink or coating material within a desired range when the
2 ink or coating material is being used in connection with flexo-
3 graphic printing processes.

4 The applicator roller 66 is preferably an anilox fluid
5 metering roller which transfers measured amounts of printing ink
6 or coating material to a plate or blanket. The surface of an
7 anilox roller is engraved with an array of closely spaced, shallow
8 depressions referred to as "cells". Ink or coating from the
9 reservoir 70 flows into the cells as the anilox roller turns
10 through the reservoir. The transfer surface of the anilox roller
11 is "doctored" (wiped or scraped) by dual doctor blades 68A, 68B to
12 remove excess ink or coating material. The ink or coating metered
13 by the anilox roller is that contained within the cells. The dual
14 doctor blades 68A, 68B also seal the supply reservoir 70.

15 The anilox applicator roller 66 is cylindrical and may
16 be constructed in various diameters and lengths, containing cells
17 of various sizes and shapes. The volumetric capacity of an anilox
18 roller is determined by cell size, shape and number of cells per
19 unit area. Depending upon the intended application, the cell
20 pattern may be fine (many small cells per unit area) or coarse
21 (fewer large cells per unit area).

22 By supplying the ink or coating material through the
23 inking/coating apparatus 10, more ink or coating material can be
24 applied to the sheet S as compared with the inking roller train of
25 a lithographic printing unit. Moreover, color intensity is
26 stronger and more brilliant because the aqueous or flexographic
27 ink or coating material is applied at a much heavier film
28 thickness or weight than can be applied by the lithographic
29 process, and the aqueous or flexographic colors are not diluted by
30 dampening solution.

31 Preferably, the sealed doctor blade assembly 68 is con-
32 structed as described in U.S. Patent 5,176,077 to Howard W.
33 DeMoore, co-inventor and assignee, which is incorporated herein by
34 reference. An advantage of using a sealed reservoir is that fast
35 drying ink or coating material can be used. Fast drying ink or

1 coating material can be used in an open fountain 53 (see FIGURE
2 8); however, open air exposure causes the water and solvents in
3 the fast-drying ink or coating material to evaporate faster, thus
4 causing the ink or coating material to dry prematurely and change
5 viscosity. Moreover, an open fountain emits unwanted odors into
6 the press room. When the sealed doctor blade assembly is
7 utilized, the pump (FIGURE 7) which circulates ink or coating
8 material to the doctor blade head is preferably a peristaltic
9 pump, which does not inject air into the feeder lines which supply
10 the ink or coating reservoir 70 and helps to prevent the formation
11 of air bubbles and foam within the ink or coating material.

12 An inking/coating apparatus 10 having an alternative
13 applicator roller arrangement is illustrated in FIGURES 10-13. In
14 this arrangement, the engraved metering surface of the anilox
15 applicator rollers 66, 67 are partitioned by smooth seal surfaces
16 66C which separates a first engraved peripheral surface portion
17 66A from a second engraved peripheral surface portion 66B.
18 Likewise, smooth seal surfaces 66D, 66E are formed on the opposite
19 end portions of the applicator roller 66 for engaging end seals
20 134, 136 (FIGURE 12) of the doctor blade reservoir. The upper
21 applicator roller 67 has engraved anilox metering surfaces 67A and
22 67B which are separated by a smooth seal band 67C.

23 Referring now to FIGURE 12 and FIGURE 13, the reservoir
24 70 of the doctor blade head 68 is partitioned by a curved seal
25 element 130 to form two separate chambers 70A, 70B. The seal
26 element 130 is secured to the doctor blade head within an annular
27 groove 132. The seal element 130 is preferably made of polyur-
28 ethane foam or other durable, resilient foam material. The seal
29 element 130 is engaged by the seal band 66, thus forming a rotary
30 seal which blocks the leakage of ink or coating material from one
31 reservoir chamber into the other reservoir chamber. Moreover, the
32 seal band provides an unprinted or uncoated area which separates
33 the printed or coated areas from each other, which is needed for
34 work and turn printing jobs or other printing jobs which print two
35 or more separate images onto the same substrate.

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1 Another advantage of the split applicator roller
2 embodiment is that it enables two or more flexographic inks or
3 coating materials to be printed simultaneously within the same
4 lithographic printing unit. That is, the reservoir chambers 70A,
5 70B of the upper doctor blade assembly can be supplied with gold
6 ink and silver ink, for example, while the reservoir chambers 70A,
7 70B of the lower doctor blade assembly can be supplied with inks
8 of two additional colors, for example opaque white ink and blue
9 ink. This permits the opaque white ink to be overprinted with the
10 gold ink, and the blue ink to be overprinted with the silver ink
11 on the same printing unit on any lithographic press.

12 Moreover, a catalyst can be used in the upper doctor
13 blade reservoir and a reactive ink or coating material can be used
14 in the lower doctor blade reservoir. This can provide various
15 effects, for example improved chemical resistance and higher gloss
16 levels.

17 The split applicator roller sections 67A, 67B in the
18 upper cradle position can be used for applying two separate inks
19 or coating materials simultaneously, for example flexographic,
20 aqueous and ultra-violet curable inks or coating materials, to
21 separate surface areas of the plate, while the lower applicator
22 roller sections 66A, 66B can apply an initiator layer and a micro-
23 encapsulated layer simultaneously to separate blanket surface
24 areas. Optionally, the metering surface portions 66A, 66B can be
25 provided with different cell metering capacities for providing
26 different printing effects which are being printed simultaneously.
27 For example, the screen line count on one half-section of an
28 anilox applicator roller is preferably in the range of 200-600
29 lines per inch (79-236 lines per cm) for half-tone images, and the
30 screen line count of the other half-section is preferably in the
31 range of 100-300 lines per inch (39-118 lines per cm) for overall
32 coverage, high weight applications such as opaque white. This
33 split arrangement in combination with dual applicator rollers is
34 particularly advantageous when used in connection with "work and
35 turn" printing jobs.

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1 Referring again to FIGURE 8, instead of using the sealed
2 doctor blade reservoir assembly 68 as shown in FIGURE 6, an open
3 fountain assembly 69 is provided by the fountain pan 53 which
4 contains a volume of liquid ink Q or coating material. The liquid
5 ink or coating material is transferred to the applicator roller 66
6 by a pan roller 55 which turns in contact with ink Q or coating
7 material in the fountain pan. If a split applicator roller is
8 used, the pan roller 55 is also split, and the pan is divided into
9 two pan sections 53A, 53B by a separator plate 53P, as shown in
10 FIGURE 16.

11 In the alternative embodiment of FIGURE 16, the pan
12 roller 55 is divided into two pan roller sections 55A, 55B by a
13 centrally located, annular groove 59. The separator plate 53P is
14 received within and centrally aligned with the groove 59, but does
15 not touch the adjoining roller faces. By this arrangement, two or
16 more inks or coating materials Q1, Q2 are contained within the
17 open pan sections 55A, 55B for transfer by the split pan roller
18 sections 53A, 53B, respectively. This permits two or more
19 flexographic inks or coating materials to be transferred to two
20 separate image areas on the plate or on the blanket of the same
21 printing unit. This arrangement is particularly advantageous for
22 work and turn printing jobs or other printing jobs which print two
23 or more separate images onto the same substrate.

24 The frame 60 of the inking/coating apparatus 10 includes
25 side support members 74, 76 which support the applicator roller
26 66, gear train 64, gear train 65, doctor blade assembly 68 and the
27 drive motor 62. The applicator roller 66 is mounted on stub
28 shafts 63A, 63B which are supported at opposite ends on a lower
29 cradle assembly 100 formed by a pair of side support members 78,
30 80 which have sockets 79, 81 and retainer caps 101, 103. The stub
31 shafts are received in roller bearings 105, 107 which permit free
32 rotation of the applicator roller 66 about its longitudinal axis
33 A1 (axis A2 in the upper cradle). The retainer caps 101, 103 hold
34 the stub shafts 63A, 63B and bearings 105, 107 in the sockets 79,

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1 81 and hold the applicator roller 66 in parallel alignment with
2 the pivot axis X.

3 The side support members 74, 76 also have an upper
4 cradle assembly 102 formed by a pair of side support members 82,
5 84 which are vertically spaced with respect to the lower side
6 plates 78, 80. Each cradle 100, 102 has a pair of sockets 79, 81
7 and 83, 85, respectively, for holding an applicator roller 66, 67
8 for spot coating or inking engagement with the printing plate P on
9 the plate cylinder 32 (FIGURE 4) or with a printing plate P or a
10 blanket B on the blanket cylinder 34.

11 Preferably, the applicator roller 67 (FIGURE 8, FIGURE
12 9) the upper cradle (plate) position is an anilox roller having a
13 resilient transfer surface. In the dual cradle arrangement as
14 shown in FIGURE 2, the press operator can quickly change from
15 blanket inking/coating to plate inking/coating within minutes,
16 since it is only necessary to release, remove and reposition or
17 replace the applicator roller 66.

18 The capability to simultaneously print in the flexo-
19 graphic mode, the aqueous mode, the waterless mode, or the litho-
20 graphic mode on different printing units of the same lithographic
21 press and to print or coat from either the plate position or the
22 blanket position on any one of the printing units is referred to
23 herein as the LITHOFLEX™ printing process or system. LITHOFLEX™
24 is a trademark of Printing Research, Inc. of Dallas, Texas,
25 U.S.A., exclusive licensee of the present invention.

26 Referring now to FIGURE 14, an inking/coating apparatus
27 10 having an inking/coating assembly 109 of an alternative design
28 is installed in the upper cradle position for applying ink and/or
29 coating material to a plate P on the plate cylinder 32. According
30 to this alternative embodiment, an applicator roller 67R having a
31 resilient transfer surface is coupled to an anilox fluid metering
32 roller which transfers measured amounts of printing ink or coating
33 material to the plate P. The anilox roller 111 has a transfer
34 surface constructed of metal, ceramic or composite material which
35 is engraved with cells. The resilient applicator roller 67R is

1 interposed in transfer engagement with the plate P and the
2 metering surface of the anilox roller 111. The resilient transfer
3 surface of the applicator roller 67R provides uniform, positive
4 engagement with the plate.

5 Referring now to FIGURE 17, an inking/coating apparatus
6 10 having an alternative inking/coating assembly 113 is installed
7 in the lower cradle assembly 100 for applying flexographic or
8 aqueous ink and/or coating material Q to a plate or blanket
9 mounted on the blanket cylinder 34. Instead of using the sealed,
10 dual doctor blade reservoir assembly 68 as shown in FIGURE 6, an
11 open, single doctor blade anilox roller assembly 113 is supplied
12 with liquid ink Q or coating material contained in an open
13 fountain pan 117. The liquid ink or coating material Q is
14 transferred to the engraved transfer surface of the anilox roller
15 66 as it turns in the fountain pan 117. Excess ink or coating
16 material Q is removed from the engraved transfer surface by a
17 single doctor blade 68B. The liquid ink or coating material Q is
18 pumped from an off-press source, for example the drum 73 shown in
19 FIGURE 17, through a supply conduit 119 into the fountain pan 117
20 by a pump 120.

21 For overall inking or coating jobs, the metering
22 transfer surface of the anilox roller 66 extends over its entire
23 peripheral surface. However, for certain printing jobs which
24 print two or more separate images onto the same substrate, for
25 example work and turn printing jobs, the metering transfer surface
26 of the anilox applicator roller 66 is partitioned by a centrally
27 located, annular undercut groove 66C which separates first and
28 second metering transfer surfaces 66A, 66B as shown in FIGURE 11
29 and FIGURE 18.

30 The single doctor blade 68B has an edge 68E which wipes
31 simultaneously against the split metering transfer surfaces 66A,
32 66B. In this single blade, split anilox roller embodiment 113, it
33 is necessary to provide dual supply sources, for example drums
34 73A, 73B, dual supply lines 119A, 119B, and dual pumps 120A, 120B.
35 Moreover, the fountain pan 117 is also split, and the pan 117 is

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1 divide into two pan sections 117A, 117B by a separator plate 121,
2 as shown in FIGURE 18. The separator plate 121 is centrally
3 aligned with the undercut groove 66C, but does not touch the
4 adjoining roller faces.

5 Although the single blade, split anilox applicator
6 roller assembly 113 is shown mounted in the lower cradle position
7 (FIGURE 17), it should be understood that the single blade, split
8 anilox applicator roller assembly 113 can be mounted and used in
9 the upper cradle position, as well.

10 According to another aspect of the present invention,
11 the inking/coating apparatus 10 is pivotally coupled on horizontal
12 pivot pins 88P, 90P which allows the single head, dual cradle ink-
13 ing/coating apparatus 10 to be mounted on any lithographic
14 printing unit. Referring to FIGURE 9, the horizontal pivot pins
15 88P, 90P are mounted within the traditional dampener space 29 of
16 the printing unit and are secured to the press side frames 14, 15,
17 respectively. Preferably, the pivot support pins 88P, 90P are
18 secured to the press side frames by a threaded fastener. The
19 pivot support pins are received within circular openings 88, 90
20 which intersect the side support members 74, 76 of the ink-
21 ing/coating apparatus 10. The horizontal support pins 88P, 90P
22 are disposed in parallel alignment with rotational axis X and with
23 the plate cylinder and blanket cylinder, and are in longitudinal
24 alignment with each other.

25 Preferably, the pivot pins 88P, 90P are located in the
26 dampener space 29 so that the rotational axes A1, A2 of the
27 applicator rollers 66, 67 are elevated with respect to the nip
28 contact points N1, N2. By that arrangement, the transfer point
29 between the applicator roller 66 and a blanket on the blanket
30 cylinder 34 (as shown in FIGURE 8) and the transfer point between
31 the applicator roller 66 and a plate on the plate cylinder 32 (as
32 shown in FIGURE 5) are above the radius lines R1, R2 of the plate
33 cylinder and the blanket cylinder, respectively. This permits the
34 inking/coating apparatus 10 to move clockwise to retract the
35 applicator roller 66 to an off-impression position relative to the

1 blank cylinder in response to a single extension stroke of the
2 power actuator arms 104A, 106A. Similarly, the applicator roller
3 66 is moved counterclockwise to the on-impression operative
4 position as shown in FIGURES 4, 5, 6 and 8 by a single retraction
5 stroke of the actuator arms 104A, 106A, respectively.

6 Preferably, the pivot pins are made of steel and the
7 side support members are made of aluminum, with the steel pivot
8 pins and the aluminum collar portion bordering the circular
9 openings 88, 90 forming a low friction journal. By this arrange-
10 ment, the inking/coating apparatus 10 is freely rotatable
11 clockwise and counterclockwise with respect to the pivot pins 88P,
12 90P. Typically, the arc length of rotation is approximately 60
13 mils (about 1.5 mm). Consequently, the inking/coating apparatus
14 10 is almost totally enclosed within the dampener space 29 of the
15 printing unit in the on-impression position and in the off-
16 impression position.

17 The cradle assemblies 100 and 102 position the applica-
18 tor roller 66 in inking/coating alignment with the plate cylinder
19 or blanket cylinder, respectively, when the inking/coating
20 apparatus 10 is extended to the operative (on-impression)
21 position. Moreover, because the inking/coating apparatus 10 is
22 installed within the dampener space 29, it is capable of freely
23 rotating through a small arc while extending and retracting
24 without being obstructed by the press side frames or other parts
25 of the printing press. This makes it possible to install the ink-
26 ing/coating apparatus 10 on any lithographic printing unit.
27 Moreover, because of its internal mounting position within the
28 dampener space 29, the projection of the inking/coating apparatus
29 10 into the space between printing units is minimal. This assures
30 unrestricted operator access to the printing unit when the
31 applicator head is in the operative (on-impression) and retracted
32 (off-impression) positions.

33 As shown in FIGURE 4 and FIGURE 5, movement of the
34 inking/coating apparatus 10 is counterclockwise from the retracted

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1 (off-impression) position to the operative (on-impression)
2 position.

3 Although the dampener side installation is preferred,
4 the inking/coating apparatus 10 can be adapted for operation on
5 the delivery side of the printing unit, with the inking/coating
6 apparatus being movable from a retracted (off-impression) position
7 to an on-impression position for engagement of the applicator
8 roller with either a plate on the plate cylinder or a blanket on
9 the blanket cylinder on the delivery side 25 of the printing unit.

10 Movement of the inking/coating apparatus 10 to the
11 operative (on-impression) position is produced by power actuators,
12 preferably double acting pneumatic cylinders 104, 106 which have
13 extendable/retractable power transfer arms 104A, 106A, respective-
14 ly. The first pneumatic cylinder 104 is pivotally coupled to the
15 press frame 14 by a pivot pin 108, and the second pneumatic
16 cylinder 106 is pivotally coupled to the press frame 15 by a pivot
17 pin 110. In response to selective actuation of the pneumatic
18 cylinders 104, 106, the power transfer arms 104A, 106A are
19 extended or retracted. The power transfer arm 104A is pivotally
20 coupled to the side support member 74 by a pivot pin 112.
21 Likewise, the power transfer arm 106A is pivotally coupled to the
22 side support member 76 by a pivot pin 114.

23 As the power arms extend, the inking/coating apparatus
24 10 is rotated clockwise on the pivot pins 88P, 90P, thus moving
25 the applicator roller 66 to the off-impression position. As the
26 power arms retract, the inking/coater apparatus 60 is rotated
27 counterclockwise on the pivot pins 88P, 90P, thus moving the
28 applicator roller 66 to the on-impression position. The torque
29 applied by the pneumatic actuators is transmitted to the ink-
30 ing/coating apparatus 10 through the pivot pin 112 and pivot pin
31 114.

32 Fine adjustment of the on-impression position of the
33 applicator roller relative to the plate cylinder or the blanket
34 cylinder, and of the pressure of roller engagement, is provided by
35 an adjustable stop assembly 115. The adjustable stop assembly 115

1 has a threaded bolt 116 which is engagable with a bell crank 118.
 2 The bell crank 118 is pivotally coupled to the side support member
 3 74 on a pin 120. One end of the bell crank 118 is engagable by
 4 the threaded bolt 116, and a cam roller 122 is mounted for
 5 rotation on its opposite end. The striking point of engagement is
 6 adjusted by rotation of the bolt 116 so that the applicator roller
 7 66 is properly positioned for inking/coating engagement with the
 8 plate P or blanket B and provides the desired amount of ink-
 9 ing/coating pressure when the inking/coating assembly 60 is moved
 10 to the operative position.

11 This arrangement permits the in-line inking/coating
 12 apparatus to operate effectively without encroaching in the
 13 interunit space between any adjacent printing units, and without
 14 blocking or obstructing access to the cylinders of the printing
 15 units when the inking/coating apparatus is in the extended (off-
 16 impression) position or retracted (on-impression) position.
 17 Moreover, when the in-line inking/coating apparatus is in the
 18 retracted position, the doctor blade reservoir and coating
 19 circulation lines can be drained and flushed automatically while
 20 the printing press is running as well as when the press has been
 21 stopped for change-over from one job to another or from one type
 22 of ink or coating to another.

23 Substrates which are printed or coated with aqueous
 24 flexographic printing inks require high velocity hot air for
 25 drying. When printing a flexographic ink such as opaque white or
 26 metallic gold, it is always necessary to dry the printed sub-
 27 strates between printing units before overprinting them.
 28 According to the present invention, the water component on the
 29 surface of the freshly printed or coated substrate S is evaporated
 30 and dried by high velocity, hot air interunit dryer and high
 31 volume heat and moisture extractor units 124, 126 and 128, as
 32 shown in FIGURE 2, FIGURE 4 and FIGURE 5. The dryer/extractor
 33 units 124, 126 and 128 are oriented to direct high velocity heated
 34 air onto the freshly printed/coated substrates as they are
 35 transferred by the impression cylinder 36 and the intermediate

1 transfer drum 40 of one printing unit and to another transfer
2 cylinder 30 and to the impression cylinder 36 of the next printing
3 unit. By that arrangement, the freshly printed flexographic ink
4 or coating material is dried before the substrate S is overprinted
5 by the next printing unit.

6 The high velocity, hot air dryer and high performance
7 heat and moisture extractor units 124, 126 and 128 utilize high
8 velocity air jets which scrub and break-up the moist air layer
9 which clings to the surface of each freshly printed or coated
10 sheet or web. Within each dryer, high velocity air is heated as
11 it flows across a resistance heating element within an air
12 delivery baffle tube. High velocity jets of hot air are dis-
13 charged through multiple airflow apertures into an exposure zone
14 Z (FIGURE 4 and FIGURE 5) and onto the freshly printed/coated
15 sheet S as it is transferred by the impression cylinder 36 and
16 transfer drum 40, respectively.

17 Each dryer assembly includes a pair of air delivery
18 dryer heads 124D, 126D and 128D which are arranged in spaced,
19 side-by-side relationship. The high velocity, hot air dryer and
20 high performance heat and moisture extractor units 124, 126 and
21 128 are preferably constructed as disclosed in co-pending U.S.
22 Patent Application Serial No. 08/132,584, filed October 6, 1993,
23 entitled "High Velocity Hot Air Dryer", to Howard W. DeMoore, co-
24 inventor and assignee of the present invention, and which is
25 incorporated herein by reference, and which is marketed by
26 Printing Research, Inc. of Dallas, Texas, U.S.A., under its
27 trademark SUPER BLUE HV™.

28 The hot moisture-laden air displaced from the surface of
29 each printed or coated sheet is extracted from the dryer exposure
30 zone Z and exhausted from the printing unit by the high volume
31 extractors 124, 126 and 128. Each extractor head includes an
32 extractor manifold 124E, 126E and 128E coupled to the dryer heads
33 124D, 126D and 128D and draws the moisture, volatiles, odors and
34 hot air through a longitudinal air gap G between the dryer heads.
35 Best results are obtained when extraction is performed simulta-

1 neous with drying. Preferably, an extractor is closely coupled
 2 to the exposure zone Z at each dryer location as shown in FIGURE
 3 4. Extractor heads 124E, 126E and 128E are mounted on the dryer
 4 heads 124D, 126D and 128D, respectively, with the longitudinal
 5 extractor air gap G facing directly into the exposure zone Z.
 6 According to this arrangement, each printed or coated sheet is
 7 dried before it is printed on the next printing unit.

8 The aqueous water-based inks used in flexographic
 9 printing evaporate at a relatively moderate temperature provided
 10 by the interunit high velocity hot air dryers/extractors 124, 126
 11 and 128. Sharpness and print quality are substantially improved
 12 since the flexographic ink or coating material is dried before it
 13 is overprinted on the next printing unit. Since the freshly
 14 printed flexographic ink is dry, dot gain is substantially reduced
 15 and back-trapping on the blanket of the next printing unit is
 16 virtually eliminated. This interunit drying/extracting arrange-
 17 ment makes it possible to print flexographic inks such as metallic
 18 ink and opaque white ink on the first printing unit, and then dry-
 19 trap and overprint on the second and subsequent printing units.

20 Moreover, this arrangement permits the first printing
 21 unit 22 to be used as a coater in which a flexographic, aqueous or
 22 UV-curable coating material is applied to the lowest grade
 23 substrate such as recycled paper, cardboard, plastic and the like,
 24 to trap and seal-in lint, dust, spray powder and other debris and
 25 provide a smoother, more durable printing surface which can be
 26 overprinted on the next printing unit.

27 A first down (primer) aqueous coating layer seals-in the
 28 surface of a low grade, rough substrate, for example, re-cycled
 29 paper or plastic, and improves overprinted dot definition and
 30 provides better ink lay-down while preventing strike-through and
 31 show-through. A flexographic UV-curable coating material can then
 32 be applied downstream over the primer coating, thus producing
 33 higher coating gloss.

34 Preferably, the applicator roller 66 is constructed of
 35 composite carbon fiber material, metal or ceramic coated metal

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1 when 1 is used for applying ink or coating material to the
2 blanket B or other resilient material on the blanket cylinder 34.
3 When the applicator roller 66 is applied to the plate, it is
4 preferably constructed as an anilox roller having a resilient,
5 compressible transfer surface. Suitable resilient roller surface
6 materials include Buna N synthetic rubber and EPDM (terpolymer
7 elastomer).

8 It has been demonstrated in prototype testing that the
9 inking/coating apparatus 10 can apply a wide range of ink and
10 coating types, including fluorescent (Day Glo), pearlescent,
11 metallics (gold, silver and other metals), glitter, scratch and
12 sniff (micro-encapsulated fragrance), scratch and reveal,
13 luminous, pressure-sensitive adhesives and the like, as well as
14 UV-curable and aqueous coatings.

15 With the dampener assembly removed from the printing
16 unit, the inking/coating apparatus 10 can easily be installed in
17 the dampener space for selectively applying flexographic inks
18 and/or coatings to a flexographic or waterless printing plate or
19 to the blanket. Moreover, overprinting of the flexographic inks
20 and coatings can be performed on the next printing unit since the
21 flexographic inks and/or coatings are dried by the high velocity,
22 hot air interunit dryer and high volume heat and moisture
23 extractor assembly of the present invention.

24 The flexographic inks and coatings as used in the
25 present invention contain colored pigments and/or soluble dyes,
26 binders which fix the pigments onto the surface of the substrate,
27 waxes, defoamers, thickeners and solvents. Aqueous printing inks
28 predominantly contain water as a diluent and/or vehicle. The
29 thickeners which are preferred include algonates, starch,
30 cellulose and its derivatives, for example cellulose esters or
31 cellulose ethers and the like. Coloring agents including organic
32 as well as inorganic pigments may be derived from dyes which are
33 insoluble in water and solvents. Suitable binders include
34 acrylates and/or polyvinylchloride.

1 When metallic inks are printed, the cells of the anilox
2 roller must be appropriately sized to prevent the metal particles
3 from getting stuck within the cells. For example, for metallic
4 gold ink, the anilox roller should have a screen line count in the
5 range of 175-300 lines per inch (68-118 lines per cm). Prefera-
6 bly, in order to keep the anilox roller cells clear, the doctor
7 blade assembly 68 is equipped with a bristle brush BR (FIGURE 14)
8 as set forth in U.S. Patent 5,425,809 to Steven M. Person,
9 assigned to Howard W. DeMoore, and licensed to Printing Research,
10 Inc. of Dallas, Texas, U.S.A., which is incorporated herein by
11 reference.

12 The inking/coating apparatus 10 can also apply UV-
13 curable inks and coatings. If UV-curable inks and coatings are
14 utilized, ultra-violet dryers/extractors are installed adjacent to
15 the high velocity hot air dryer/extractor units 124, 126 and 128,
16 respectively.

17 It will be appreciated that the LITHOFLEX™ printing
18 process described herein makes it possible to selectively operate
19 a printing unit of a press in the lithographic printing mode while
20 simultaneously operating another printing unit of the same press
21 in either the flexographic printing mode or in the waterless
22 printing mode, while also providing the capability to print or
23 coat, separately or simultaneously, from either the plate position
24 or the blanket position. The dual cradle support arrangement of
25 the present invention makes it possible to quickly change over
26 from inking/coating on the blanket cylinder position to ink-
27 ing/coating on the plate cylinder position with minimum press
28 down-time, since it is only necessary to remove and reposition or
29 replace the applicator roller 66 while the inking/coating
30 apparatus 10 is in the retracted position. It is only necessary
31 to remove four cap screws, lift the applicator roller 66 from the
32 cradle, and reposition it in the other cradle. All of this can be
33 accomplished in a few minutes, without removing the inking/coating
34 apparatus 10 from the press.

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1 materials must be compatible for good transfer during the double
2 bump. Moreover, the inking/coating apparatus 10 can be used for
3 supplying ink or coating material to the blanket cylinder of a
4 rotary offset web press, or to the blanket of a dedicated coating
5 unit.

6 According to conventional bronzing techniques, a
7 metallic (bronze) powder is applied off-line to previously printed
8 substrate which produces a grainy, textured finish or appearance.
9 The on-line application of bronze material by conventional flexo-
10 graphic or lithographic printing will only produce a smooth,
11 continuous appearance. However, a grainy, textured finish is
12 preferred for highest quality printing which, prior to the present
13 invention, could only be produced by off-line methods.

14 Referring now to FIGURE 14 and FIGURE 15, metallic ink
15 or coating material is applied on-line to the substrate S by
16 simultaneous operation of the upper and lower applicator rollers
17 67R, 66 to produce an uneven surface finish having a bronze-like
18 textured or grainy appearance. According to the simulated
19 bronzing method of the present invention, the flexographic bronze
20 ink is applied simultaneously to the plate and to the blanket by
21 the dual cradle inking/coating apparatus 10 as shown in FIGURE 14.
22 A resilient applicator roller 67R is mounted in the upper cradle
23 102, and an anilox applicator roller 66 is mounted on the lower
24 cradle 100. The rollers are supplied from separate doctor blade
25 reservoirs 70. The doctor blade reservoir 70 in the upper cradle
26 position supplies bronze ink or coating material having relatively
27 coarse, metallic particles 140 dispersed in aqueous or flexo-
28 graphic ink. The coarse particle ink or coating material is
29 applied to the plate P by the resilient applicator roller 67R in
30 the upper cradle position 102. At the same time, flexographic
31 and/or bronze ink or coating material having relatively fine,
32 metallic particles 142 is transferred to the blanket B by the
33 anilox roller 66 which is mounted on the lower cradle 100.

34 The metering surfaces of the upper and lower applicator
35 rollers have different cell sizes and volumetric capacities which

1 accommodate the coarse and fine metallic particles. For example,
2 the anilox roller 111 mounted in the upper cradle position 102
3 which transfers the coarse metallic particles 140 preferably has
4 a screen line count in the range of 100-300 lines per inch (39-118
5 lines per cm), and the metering surface of the anilox roller 66
6 mounted on the lower cradle 100 which transfers the relatively
7 fine metallic particles 142 preferably has a screen line count in
8 the range of 200-600 lines per inch (79-236 lines per cm).

9 After transfer from the plate to the blanket, the fine
10 metallic particles 142 form a layer over the coarse metallic
11 particles 140. As both bronze layers are offset onto the
12 substrate S, the layer of fine metallic particles 142 is printed
13 onto the substrate S with the top layer of coarse metallic
14 particles 140 providing a textured, grainy appearance. The fine
15 metallic particles 142 cover the substrate which would otherwise
16 be visible in the gaps between the coarse metallic particles 140.
17 The combination of the coarse particle layer over the fine
18 particle layer thus provides a textured, bronzed-like finish and
19 appearance.

20 Particulate materials other than metal can be used for
21 producing a textured finish. For example, coarse and fine
22 particles of metallized plastic (glitter), mica particles
23 (pearlescent) and the like, can be substituted for the metallic
24 particles for producing unlimited surface variations, appearances
25 and effects. All of the particulate material, including the
26 metallic particles, are preferably in solid, flat platelet form,
27 and have a size dimension suitable for application by an anilox
28 applicator roller. Other particulate or granular material, for
29 example stone grit having irregular form and size, can be used to
30 good advantage.

31 Solid metal particles in platelet form, which are good
32 reflectors of light, are preferred for producing the bronzed-like
33 appearance and effect. However, various textured finishes, which
34 could have light-reflective properties, can be produced by using
35 granular materials such as stone grit. Most commonly used metals

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1 include copper, zinc and aluminum. Other ductile metals can be
2 used, if desired. Moreover, the coarse and fine particles need
3 not be made of the same particulate material. Various effects and
4 textured appearances can be produced by utilizing diverse
5 particulate materials for the coarse particles and the fine
6 particles, respectively. Further, either fine or coarse particle
7 ink or coating material can be printed from the upper cradle
8 position, and either fine or coarse particle ink or coating
9 material can be printed from the lower cradle position, depending
10 on the special or surface finish that is desired.

11 It will be appreciated that the last printing unit 28
12 can be configured for additional inking/coating capabilities which
13 include lithographic, waterless, aqueous and flexographic
14 processes. Various substrate surface effects (for example double
15 bump or triple bump inking/coating or bronzing) can be performed
16 on the last printing unit. For triple bump inking/coating, the
17 last printing unit 28 is equipped with an auxiliary in-line inking
18 or coating apparatus 97 as shown in FIGURE 3 and FIGURE 4. The
19 in-line inking or coating apparatus 97 allows the application of
20 yet another film of ink or a protective or decorative layer of
21 coating material over any freshly printed or coated surface
22 effects or special treatments, thereby producing a triple bump.
23 The triple bump is achieved by applying a third film of ink or
24 layer of coating material over the freshly printed or coated
25 double bump simultaneously while the substrate is on the impres-
26 sion cylinder of the last printing unit.

27 When the in-line inking/coating apparatus 97 is
28 installed, it is necessary to remove the SUPER BLUE® flexible
29 covering from the delivery cylinder 42, and it is also necessary
30 to modify or convert the delivery cylinder 42 for inking/coating
31 service by mounting a plate or blanket B on the delivery cylinder
32 42, as shown in FIGURE 3 and FIGURE 4. Packing material is placed
33 under the plate or blanket B, thereby packing the plate or blanket
34 B at the correct packed-to-print radial clearance so that ink or
35 coating material will be printed or coated onto the freshly

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1 printed substrate S as it transfers through the nip between the
2 plate or blanket B on the converted delivery cylinder 42 and the
3 last impression cylinder 36. According to this arrangement, a
4 freshly printed or coated substrate is overprinted or overcoated
5 with a third film or layer of ink or coating material simulta-
6 neously while a second film or layer of ink or coating material is
7 being over-printed or over-coated on the last impression cylinder
8 36.

9 The auxiliary inking/coating apparatus 97 and the
10 converted or modified delivery cylinder 42 are mounted on the
11 delivery drive shaft 43. The inking/coating apparatus 97 includes
12 an applicator roller, preferably an anilox applicator roller 97A,
13 for supplying ink or coating material to a plate or blanket B on
14 the modified or converted delivery cylinder 42. The in-line
15 inking/coating apparatus 97 and the modified or converted delivery
16 cylinder 42 are preferably constructed as described in U.S. Patent
17 5,176,077 to Howard W. DeMoore (co-inventor and assignee), which
18 is hereby incorporated by reference. The in-line inking/coating
19 apparatus 97 is manufactured and sold by Printing Research, Inc.
20 of Dallas, Texas, U.S.A., under its trademark SUPER BLUE EZ
21 COATER™.

22 After the delivery cylinder 42 has been modified or
23 converted for inking/coating service, and because of the reduced
24 nip clearance imposed by the plate or blanket B, the modified
25 delivery cylinder 42 can no longer perform its original function
26 of guiding and transferring the freshly printed or coated
27 substrate. Instead, the modified or converted delivery cylinder
28 42 functions as a part of the inking/coating apparatus 97 by
29 printing or coating a third down film of ink or layer of coating
30 material onto the freshly printed or coated substrate as it is
31 simultaneously printed or coated on the last impression cylinder
32 36. Moreover, the mutual tack between the second down ink film or
33 coating layer and the third down ink film or coating layer causes
34 the overprinted or overcoated substrate to cling to the plate or

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1 blank, thus opposing or resisting separation of the substrate
2 from the plate or blanket.

3 To remedy this problem, a vacuum-assisted transfer
4 apparatus 99 is mounted adjacent the modified or converted
5 delivery cylinder 42 as shown in FIGURE 3 and FIGURE 4. Another
6 purpose of the vacuum-assisted transfer apparatus 99 is to
7 separate the freshly overprinted or overcoated triple bump
8 substrate from the plate or blanket B as the substrate transfers
9 through the nip. The vacuum-assisted transfer apparatus 99
10 produces a pressure differential across the freshly overprinted or
11 overcoated substrate as it transfers through the nip, thus
12 producing a separation force onto the substrate and providing a
13 clean separation from the plate or blanket B.

14 The vacuum-assisted transfer apparatus 99 is preferably
15 constructed as described in U.S. Patent Nos. 5,113,255; 5,127,329;
16 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W.
17 DeMoore, co-inventor, which are incorporated herein by reference.
18 The vacuum-assisted transfer apparatus 99 is manufactured and sold
19 by Printing Research, Inc. of Dallas, Texas, U.S.A. under its
20 trademark BACVAC™.

21 Although the present invention and its advantages have
22 been described in detail, it should be understood that various
23 changes, substitutions and alterations can be made herein without
24 departing from the spirit and scope of the present invention as
defined by the appended claims.

1 1. A method for printing in a rotary offset press of
2 the type including first and second printing units, the first
3 printing unit having a flexographic printing plate, a blanket, an
4 impression cylinder and inking/coating applicator means for
5 applying aqueous or flexographic printing ink or coating material
6 to the flexographic printing plate and/or to the blanket,
7 comprising the following steps performed in succession in the
8 first printing unit:

9 applying a first spot or overall coating of aqueous
10 or flexographic printing ink or coating material to the flexo-
11 graphic printing plate;

12 transferring the aqueous or flexographic printing
13 ink or coating material from the flexographic printing plate to
14 the blanket;

15 applying a second spot or overall film of aqueous
16 or flexographic printing ink or layer of coating material to the
17 blanket;

18 transferring ink or coating material from the
19 blanket to a substrate as the substrate is transferred through the
20 nip between the blanket and the impression cylinder; and,

21 drying the aqueous or flexographic ink or coating
22 material on the freshly printed or coated substrate before the
23 substrate is printed, coated or otherwise processed on the second
 printing unit.

1 2. The printing method as defined in claim 1,
2 including the steps:

3 applying a primer coating of an aqueous or
4 flexographic ink or coating material to a substrate in the first
5 printing unit;

6 trapping and sealing particulate material such as
7 dust, lint, anti-offset spray powder and the like under the primer
8 coating;

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9 drying the primer coating on the substrate before
10 the substrate is printed or coated on the second printing unit;
11 and,
12 overprinting the freshly coated substrate in the
second printing unit.

1 3. The printing method as defined in claim 1,
2 wherein the drying step is performed by directing
3 heated air onto the freshly printed or coated substrate while the
4 freshly printed or coated substrate is in contact with the
impression cylinder of the first printing unit.

1 4. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an intermediate transfer cylinder disposed between
5 the first and second printing units; and,
6 drying the freshly printed or coated substrate
7 while said substrate is in contact with the intermediate transfer
cylinder.

1 5. The printing method as defined in claim 1, wherein:
2 the drying step is performed by directing heated
3 air onto the freshly printed or coated substrate while the freshly
4 printed or coated substrate is in contact with an impression
cylinder in the second printing unit.

1 6. The printing method as defined in claim 1, wherein
2 the drying step is performed by directing heated air from a dryer
3 onto the freshly printed or coated substrate, and including the
4 step:
5 extracting hot air, moisture and volatiles from an
6 exposure zone between the freshly printed or coated substrate and
7 the dryer while the freshly printed or coated substrate is in
contact with the impression cylinder of the first printing unit.

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1 7. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an intermediate transfer cylinder disposed between
5 the first and second printing units;
6 directing heated air from a dryer onto the freshly
7 printed or coated substrate while said substrate is in contact
8 with the intermediate transfer cylinder; and,
9 extracting hot air, moisture and volatiles from an
10 exposure zone between the freshly printed or coated substrate and
11 said dryer while the freshly printed or coated substrate is in
contact with the intermediate transfer cylinder.

1 8. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an impression cylinder on the second printing unit;
5 directing heated air from a dryer onto the freshly
6 printed or coated substrate while said substrate is in contact
7 with the impression cylinder of the second printing unit; and,
8 extracting hot air, moisture and volatiles from an
9 exposure zone between the freshly printed or coated substrate and
10 said dryer while said substrate is in contact with the impression
cylinder of the second printing unit.

1 9. A method for providing an uneven printed or coated
2 layer on a substrate in a rotary offset printing press of the type
3 including a printing unit having a plate cylinder, a flexographic
4 printing plate mounted on the plate cylinder, a blanket cylinder,
5 a plate or blanket mounted on the blanket cylinder, an impression
6 cylinder and applicator means for applying aqueous or flexographic
7 printing ink or coating material to the flexographic printing
8 plate and/or to the plate or blanket on the blanket cylinder,
9 comprising the following steps performed in succession in the
10 printing unit:

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11 applying a first down layer of aqueous or flexo-
12 graphic ink or coating material containing relatively coarse
13 particles to the flexographic plate;
14 transferring the relatively coarse particle
15 printing ink or coating material from the flexographic printing
16 plate to the plate or blanket on the blanket cylinder;
17 applying a second down layer of aqueous or
18 flexographic printing ink or coating material containing relative-
19 ly fine particles onto the relatively coarse particle printing ink
20 or coating material;
21 transferring the coarse and fine particle ink or
22 coating material from the blanket or plate on the blanket cylinder
23 onto a substrate as the substrate is transferred through the nip
24 between the blanket cylinder and the impression cylinder; and,
25 drying the freshly printed or coated substrate
26 before the freshly printed or coated substrate is subsequently
printed, coated or otherwise processed.

1 10. The method as set forth in claim 9, wherein the
2 coarse and fine particles comprise a metal selected from the group
including copper, zinc and aluminum.

1 11. The method as set forth in claim 9, wherein the
2 coarse and fine particles comprise a non-metallic material
3 selected from the group consisting of mica, silicon, stone grit
and plastic.

1 12. The method as set forth in claim 9, wherein the
2 coarse and fine particles comprise diverse particulate materials,
respectively.

1 13. A method for printing or coating a substrate on the
2 last printing unit of a rotary offset printing press of the type
3 including a plate cylinder, a printing plate mounted on the plate
4 cylinder, a blanket cylinder, a plate or blanket mounted on the

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5 blank cylinder, an impression cylinder, inking/coating apparatus
6 for applying printing ink or coating material simultaneously or
7 separately to the flexographic printing plate and/or to the plate
8 or blanket on the blanket cylinder, and including an ink-
9 ing/coating cylinder mounted adjacent the last printing unit for
10 printing a film of ink or layer of coating material over a freshly
11 printed substrate, comprising the steps:

12 applying a first down film of printing ink or layer
13 of coating material to the printing plate;

14 transferring printing ink or coating material from
15 the printing plate to a plate or blanket on the blanket cylinder;

16 applying a second down film of printing ink or
17 layer of coating material over the first down film or layer on the
18 plate or blanket on the blanket cylinder;

19 transferring ink or coating material from the
20 blanket or plate on the blanket cylinder onto a substrate as the
21 substrate is transferred through the nip between the blanket
22 cylinder and the impression cylinder; and

23 simultaneously printing a third down film of
24 printing ink or layer of coating material over the second down
25 film of ink or layer of coating material while the second down
26 film or layer is being printed or coated on the last impression
cylinder.

1 14. A method for printing or coating a substrate in a
2 rotary offset printing press of the type including a printing unit
3 having a plate cylinder, a flexographic printing plate mounted on
4 the plate cylinder, a blanket cylinder, a plate or blanket mounted
5 on the blanket cylinder, an impression cylinder, and ink-
6 ing/coating apparatus for applying flexographic or aqueous
7 printing ink or coating material to the flexographic printing
8 plate and/or to the plate or blanket on the blanket cylinder,
9 comprising the following steps:

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10 applying a first down film or layer of flexographic
11 or aqueous printing ink or coating material to the flexographic
12 printing plate;

13 transferring printing ink or coating material from
14 the flexographic printing plate to the plate or blanket on the
15 blanket cylinder;

16 applying a second down film or layer of aqueous or
17 flexographic printing ink or coating material over the first down
18 film or layer on the plate or blanket on the blanket cylinder;

19 transferring ink or coating material from the
20 blanket or plate on the blanket cylinder onto a substrate as the
21 substrate is transferred through the nip between the blanket
22 cylinder and the impression cylinder; and,

23 drying the freshly printed or coated substrate
24 before the substrate is subsequently printed, coated or otherwise
processed.

1 15. A method of printing or coating a substrate in a
2 rotary offset printing press as set forth in claim 14, wherein the
3 printing unit is the last printing unit of the rotary offset
4 printing press and a delivery cylinder is mounted on the last
5 printing unit for transferring the freshly printed substrate along
6 a substrate travel path, including the steps:

7 modifying the delivery cylinder by mounting a plate
8 or blanket on the delivery cylinder;

9 transferring ink or coating material to the plate
10 or blanket on the modified delivery cylinder; and

11 transferring a third down film or layer of aqueous
12 or flexographic printing ink or coating material from the plate or
13 blanket over the second down film or layer simultaneously while
14 the freshly printed or coated substrate is on the last impression
cylinder of the last printing unit.

1 16. A method for rotary offset printing as defined in
2 any one of claims 1, 9, 13 or 14, including the steps:

3 circulating liquid ink or coating material from a
4 supply container to said inking/coating applicator means and from
5 said inking/coating applicator means to the supply container; and,
6 heating or cooling the liquid ink or coating
material as it is circulated.

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RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE
AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER
SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE
PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS"

Abstract of the Disclosure

1 A retractable in-line inking/coating apparatus can apply
2 either spot or overall inking/coating material to a plate and/or
3 a blanket on the first printing unit or on any consecutive
4 printing unit of any rotary offset printing press. The ink-
5 ing/coating apparatus is pivotally mounted within the conventional
6 dampener space of any lithographic printing unit. The aqueous
7 component of the flexographic printing ink or aqueous coating
8 material is evaporated and dried by high velocity, hot air dryers
9 and high performance heat and moisture extractors so that the
10 aqueous or flexographic ink or coating material on a freshly
11 printed or coated sheet is dry and can be dry-trapped on the next
12 printing unit. The inking/coating apparatus includes dual cradles
13 that support first and second applicator rollers so that the ink-
14 ing/coating apparatus can apply a double bump of aque-
15 ous/flexographic or UV-curable printing ink or coating material to
16 a plate on the plate cylinder, while simultaneously applying
17 aqueous, flexographic or UV-curable printing ink or coating
18 material to a plate or a blanket on the blanket cylinder, and
19 thereafter onto a sheet as the sheet is transferred through the
20 nip between the blanket cylinder and the impression cylinder. A
21 triple bump is printed or coated on the last printing unit with
22 the aid of an impression cylinder inking/coating unit.

* * * * *

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RONALD M. RENDLEMAN
JOHN W. BIRD

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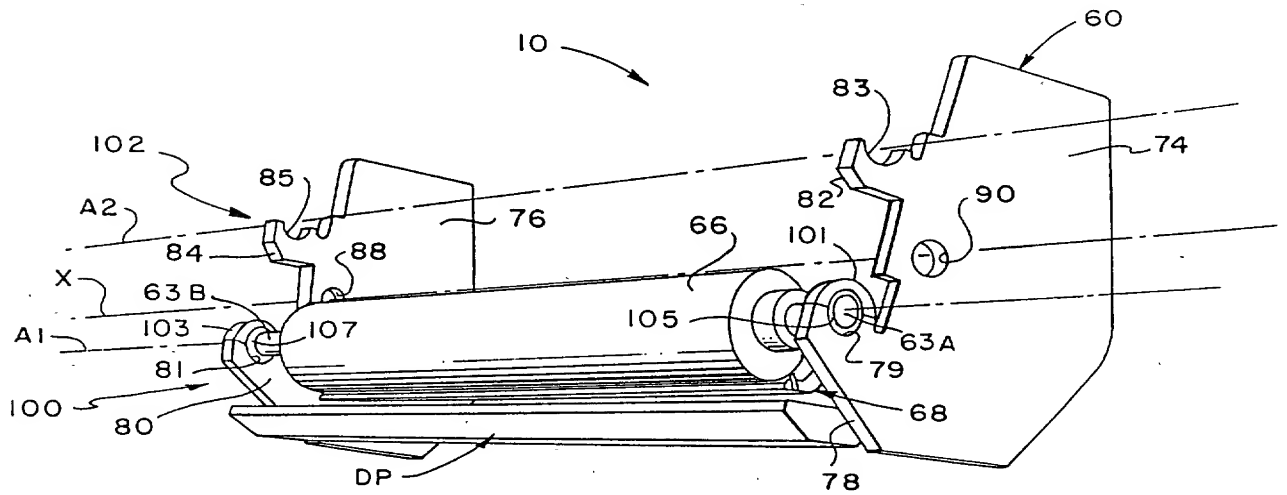
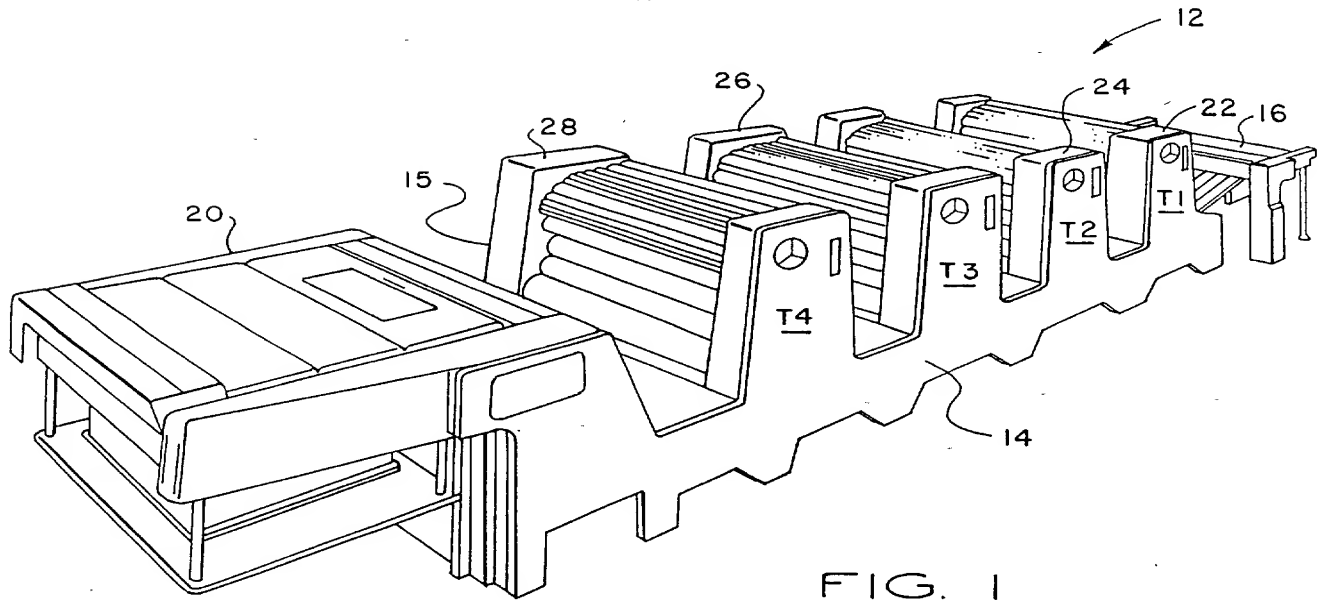


FIG. 3

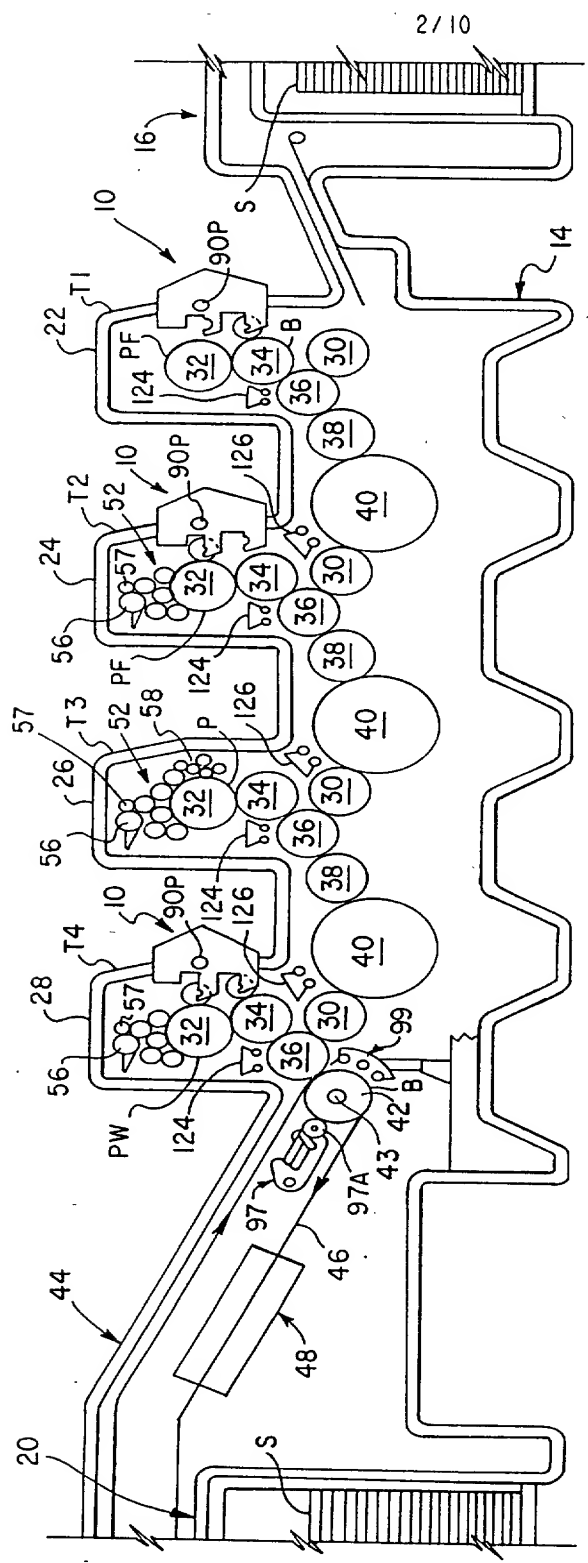
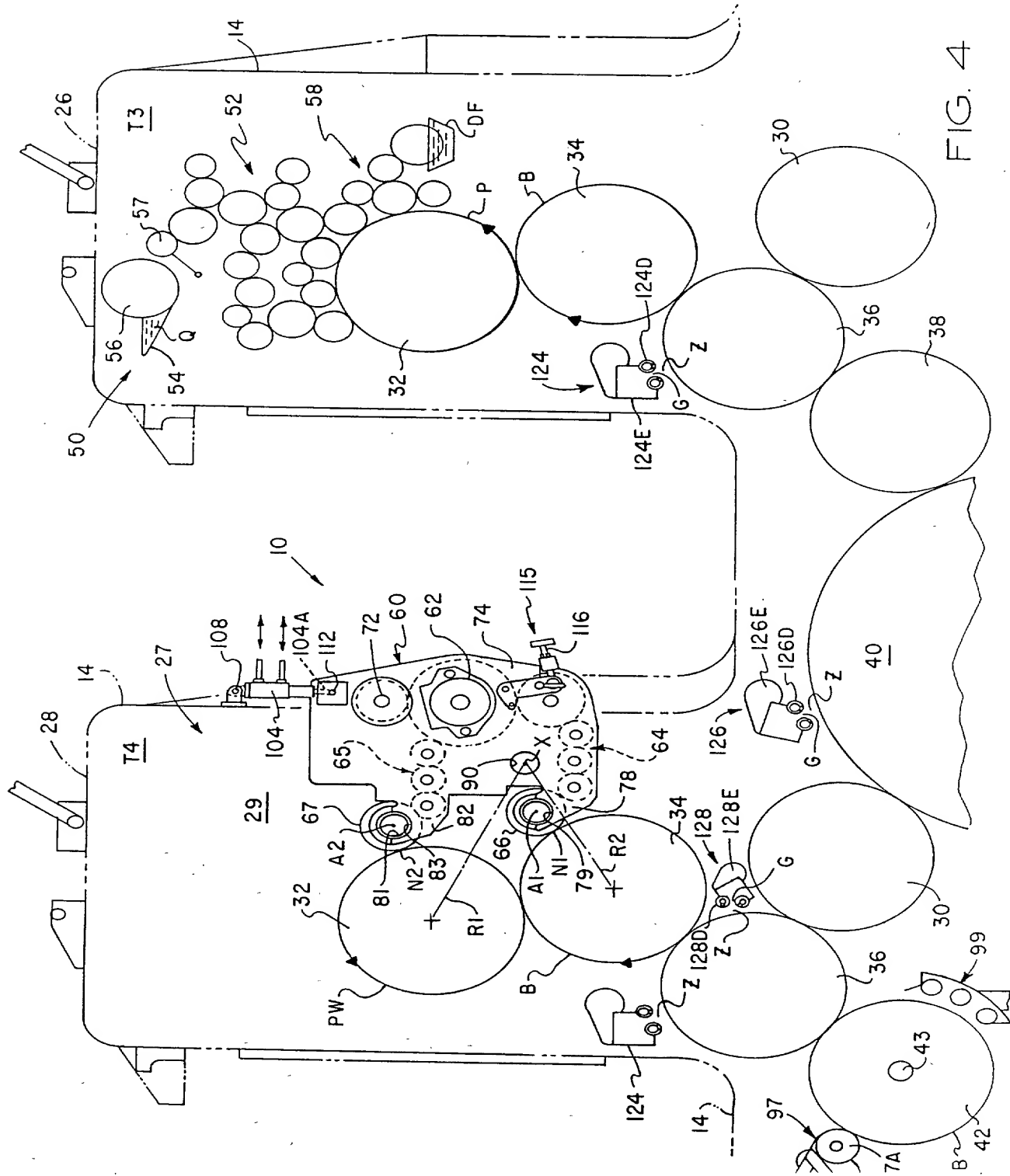


FIG. 3

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FIG. 5

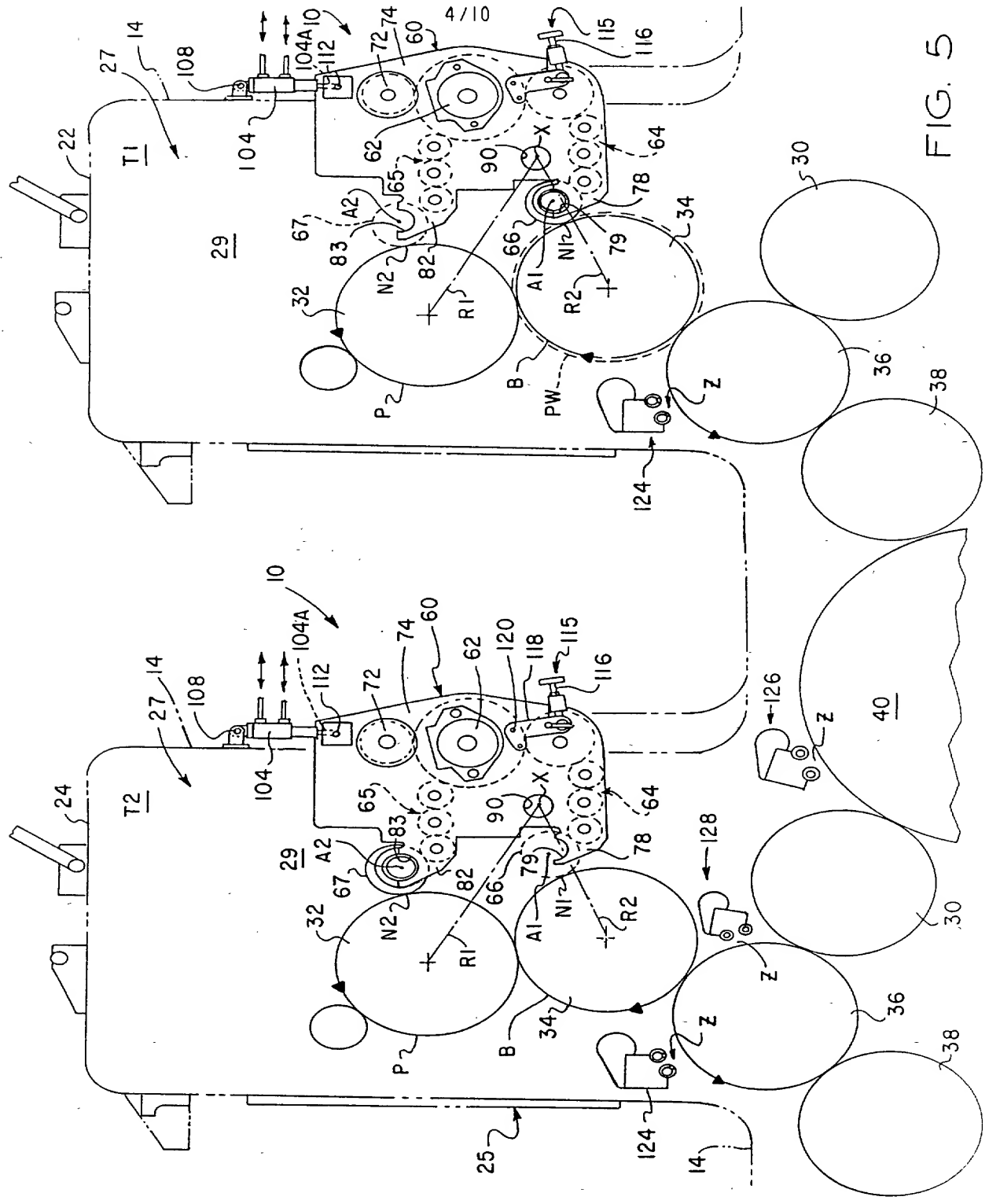


FIG. 5

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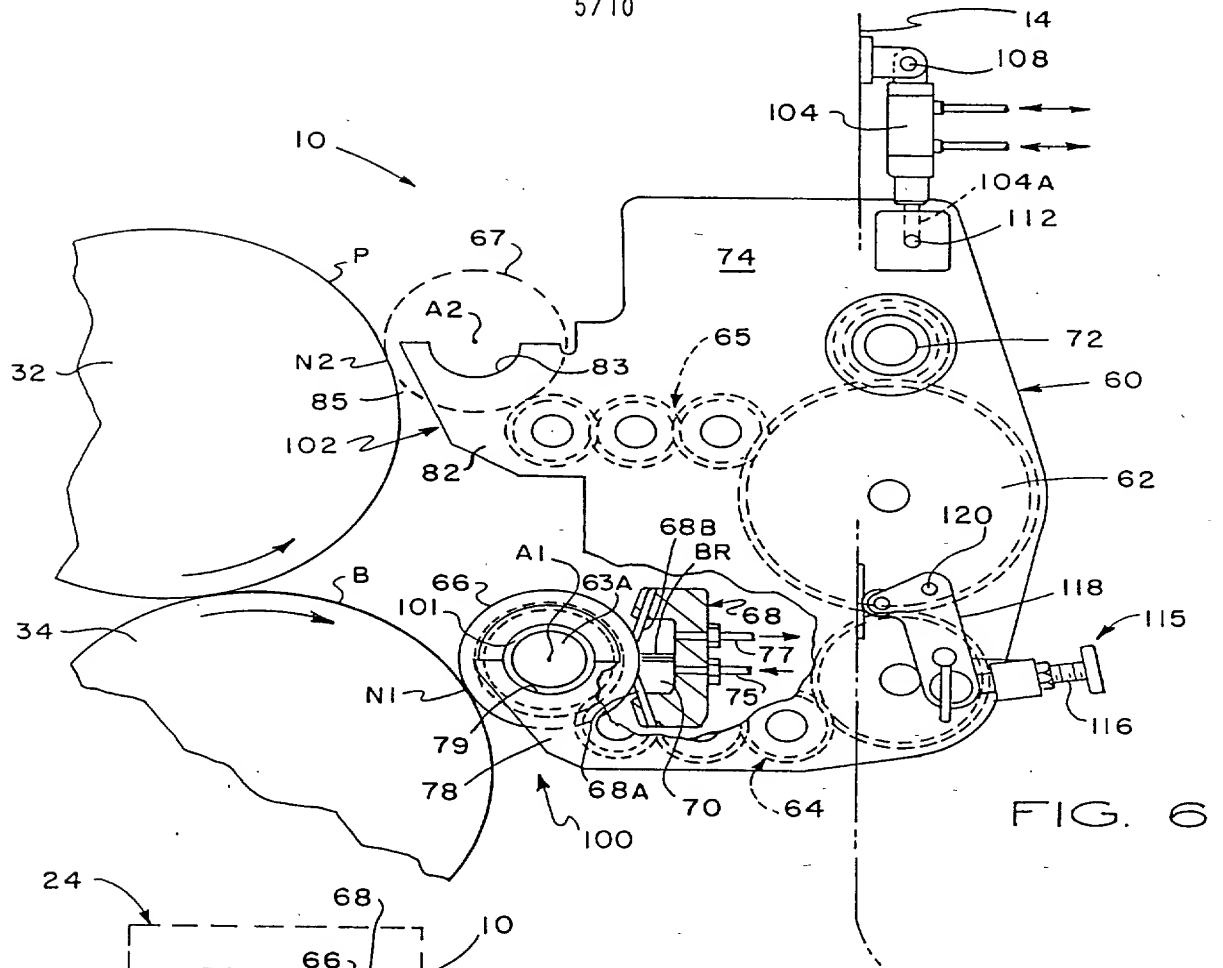


FIG. 6

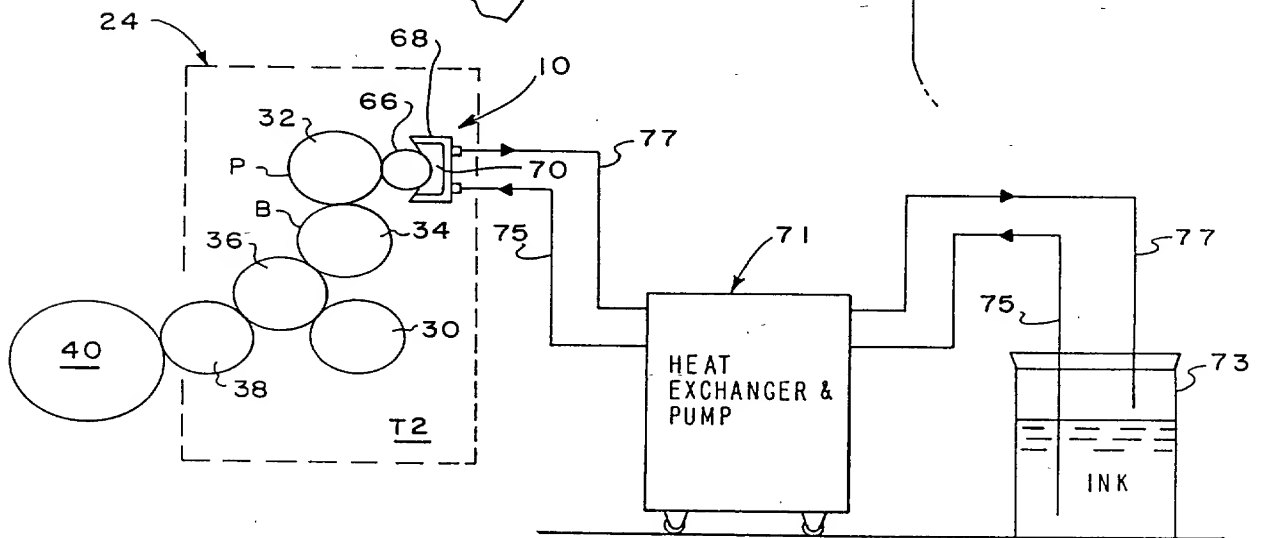


FIG. 7

FIG. 6

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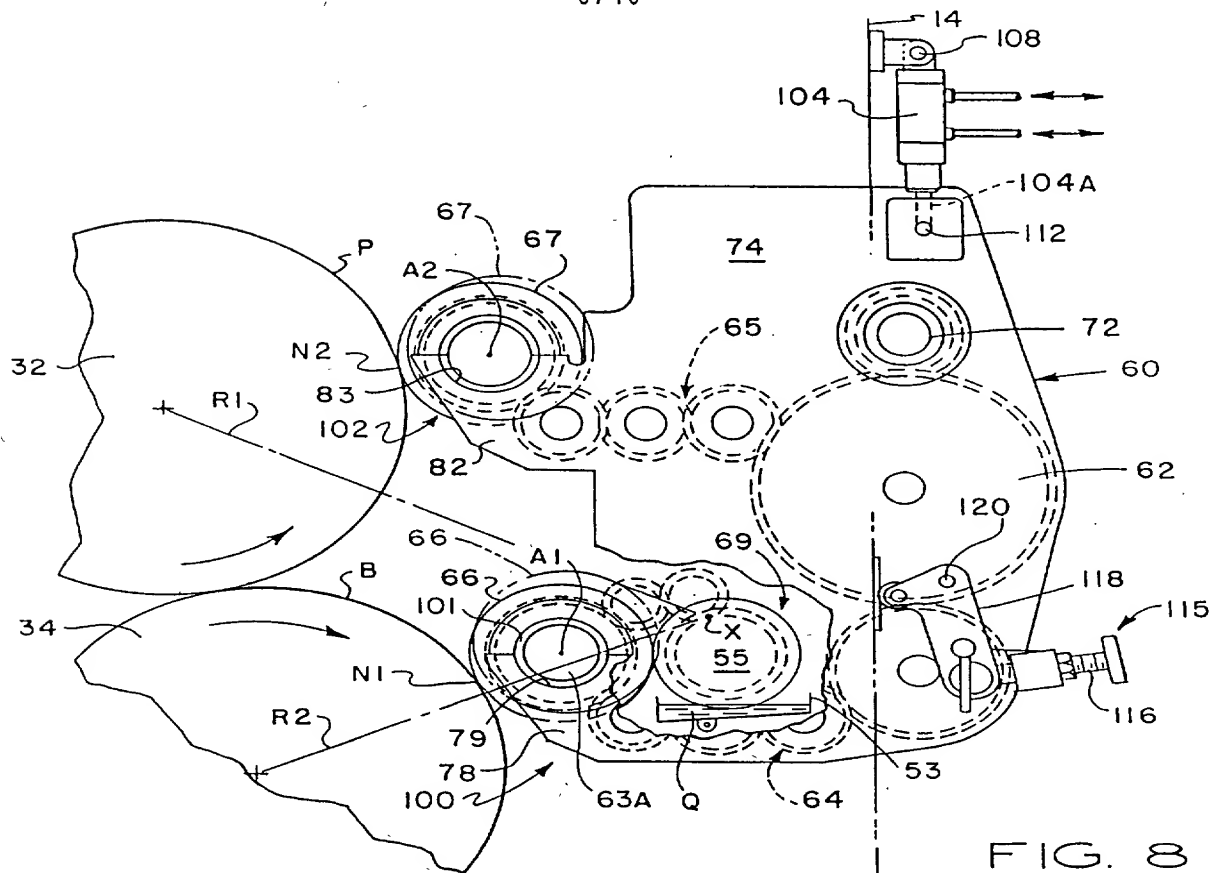


FIG. 8

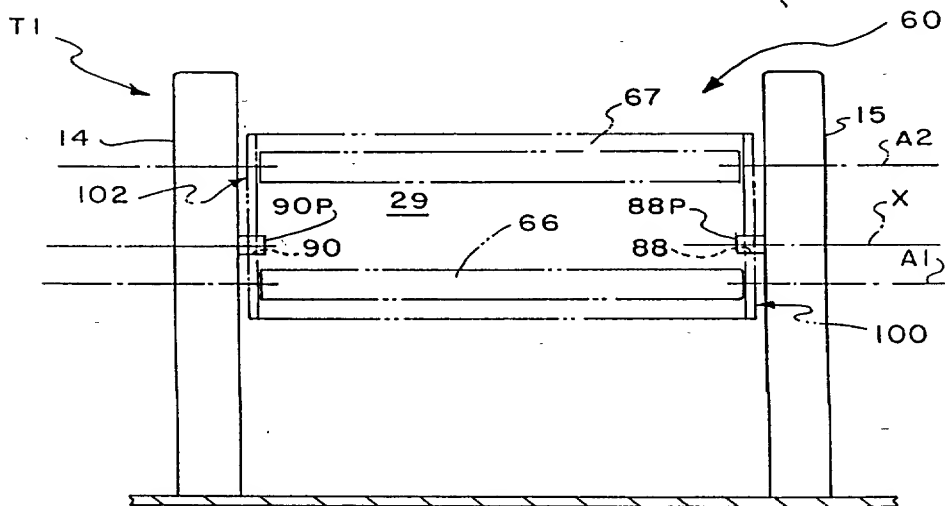


FIG. 9

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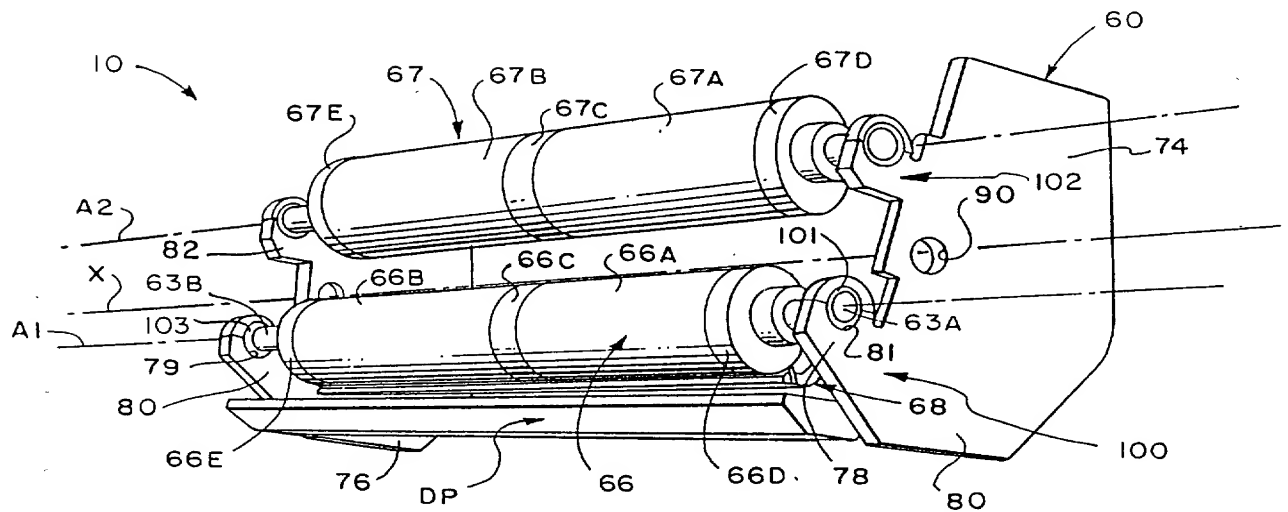


FIG. 10

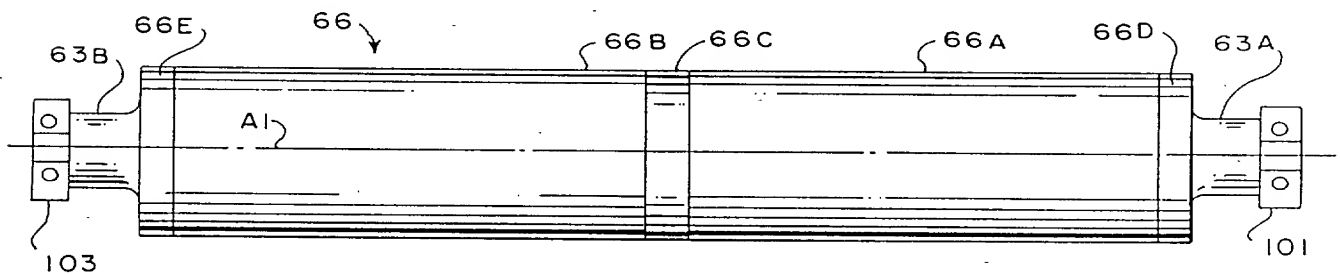


FIG. 11

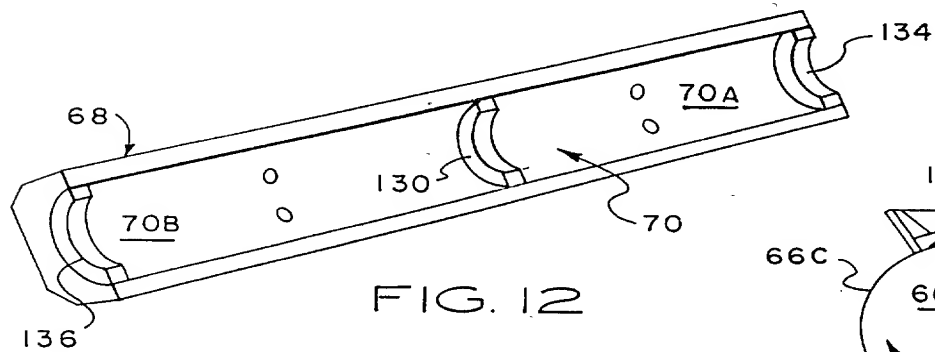


FIG. 12

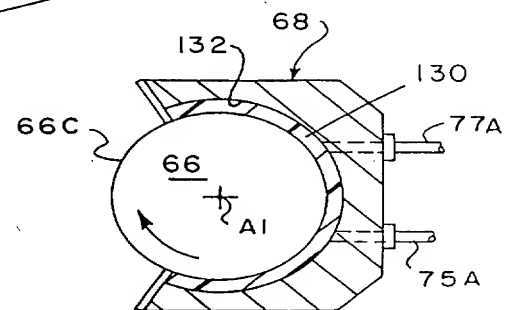


FIG. 13

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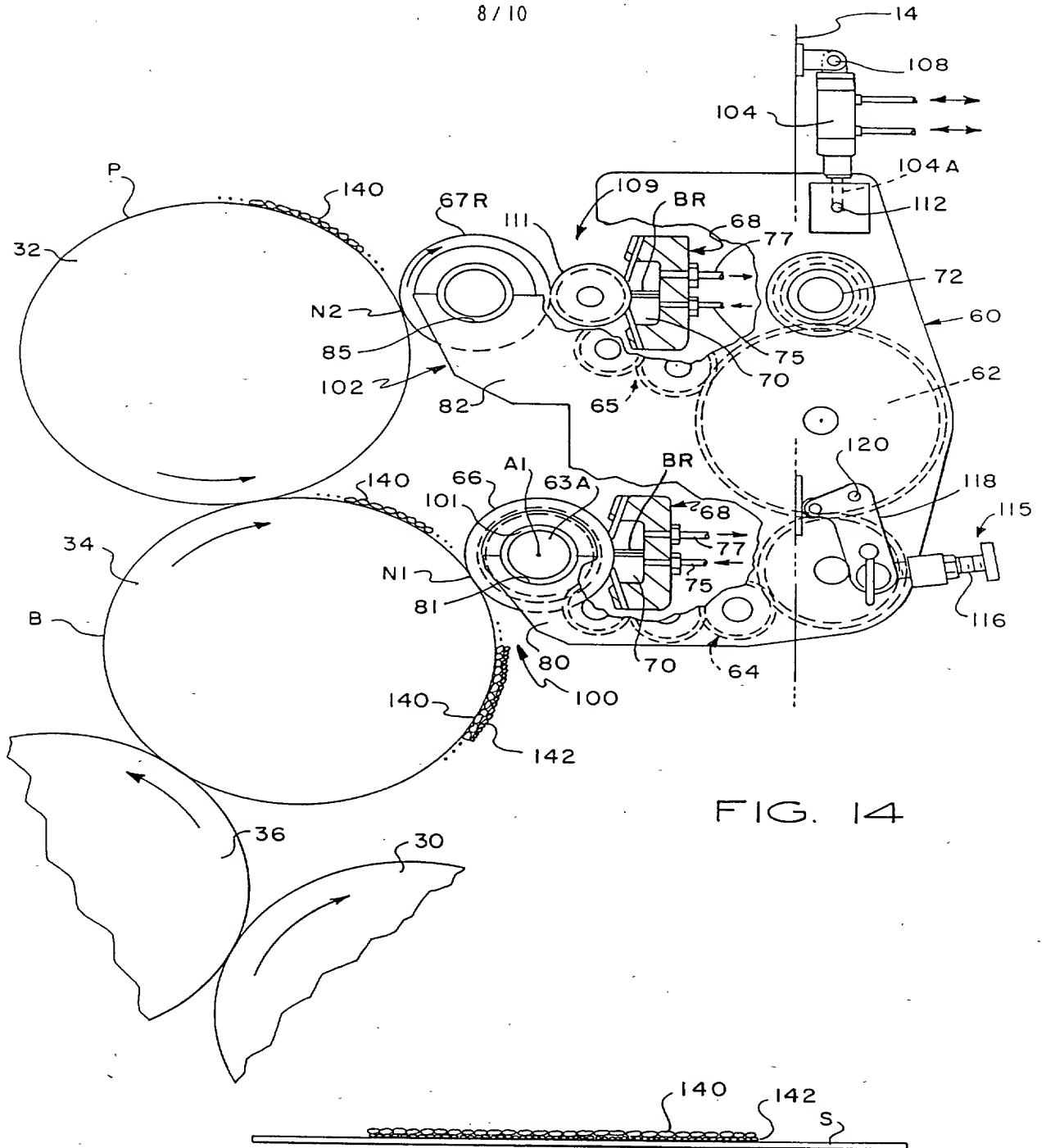
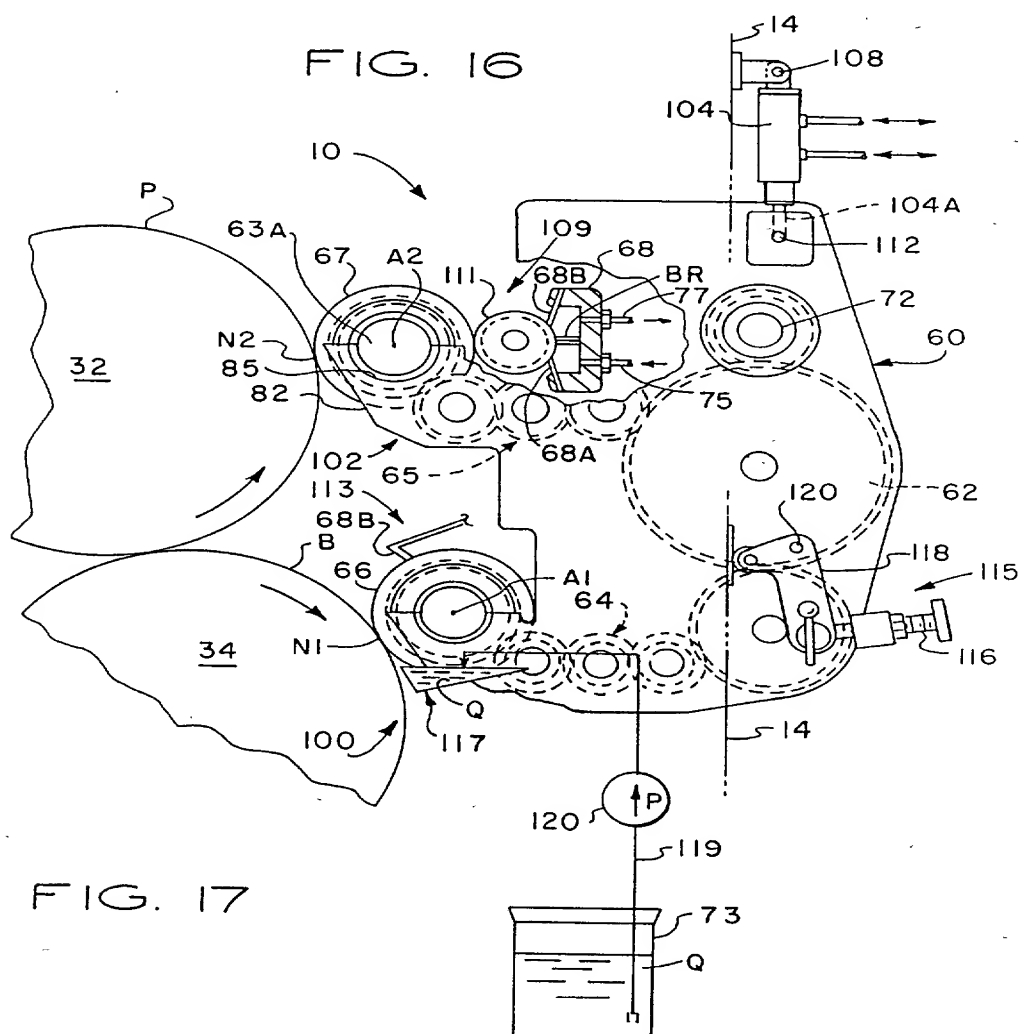
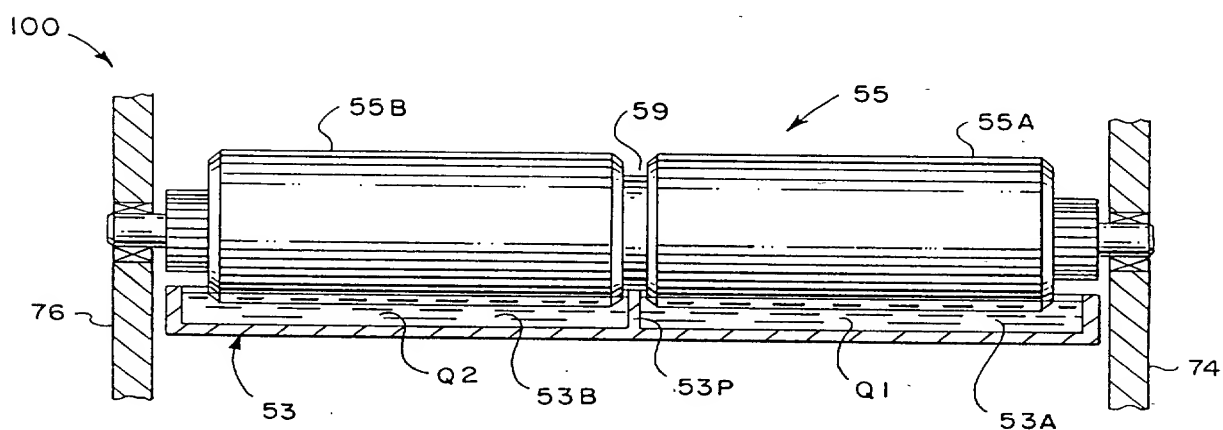


FIG. 15



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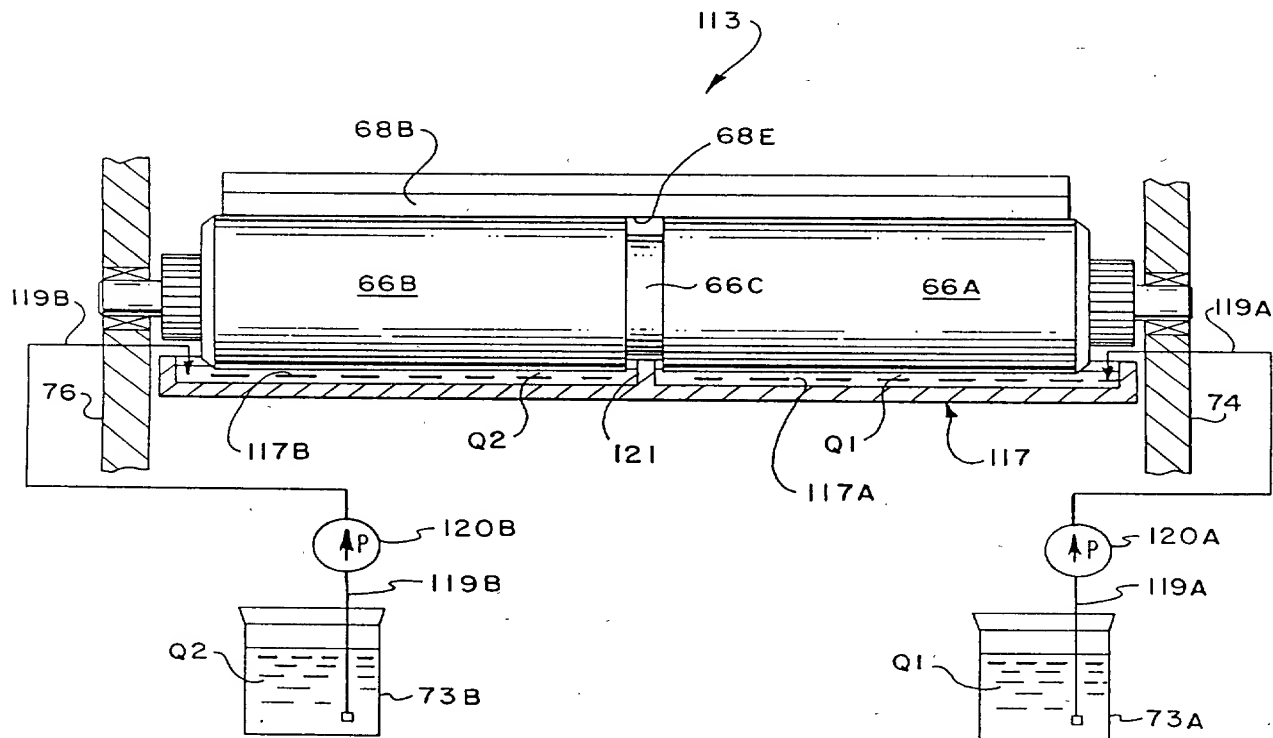


FIG. 18

UEXKÜLL & STOLBERG

PATENTANWALTE

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18. 10. 1996
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0944796-064404

Application No.: 96250219.1

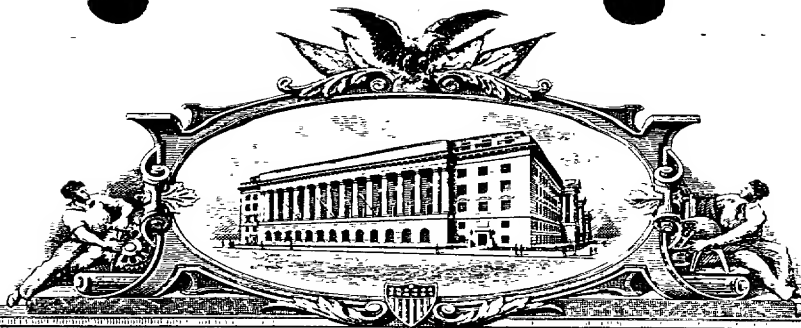
Applicant : Howard W. DeMoore

Please find the following documents enclosed:

- Priority Document


A. Huber
(Association No. 1)

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R.T. Koerse 25. 10. 1996



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APPLICATION NUMBER: 08/538,123

FILING DATE: October 2, 1995

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PA 3538123

Attorney Docket
No. B6038B

SPECIFICATION

accompanying

Application for Grant of U.S. Letters Patent

JOINT

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0035796-054104
TITLE: "RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE
PLATE AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE
DAMPENER SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECU-
TIVE PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS"

Field of the Invention

1 This invention relates generally to sheet-fed or web-
2 fed, rotary offset lithographic printing presses, and more
3 particularly, to a new and improved inking/coating apparatus for
4 the in-line application of aqueous or flexographic printing inks,
5 primer or protective/decorative coatings applied simultaneously to
6 the plate and blanket of the first or any consecutive printing
7 unit of any lithographic printing press.

8 Background of the Invention

9 Conventional sheet-fed, rotary offset printing presses
10 typically include one or more printing units through which
11 individual sheets are fed and printed. After the last printing
12 unit, freshly printed sheets are transferred by a delivery
13 conveyor to the delivery end of the press where the freshly
14 printed and/or coated sheets are collected and stacked uniformly.
15 In a typical sheet-fed, rotary offset printing press such as the
16 Heidelberg Speedmaster line of presses, the delivery conveyor
17 includes a pair of endless chains carrying gripper bars with

1 gripper fingers which grip and pull freshly printed sheets from
2 the last impression cylinder and convey the sheets to the sheet
3 delivery stacker.

4 Since the inks used with sheet fed rotary offset
5 printing presses are typically wet and tacky, special precautions
6 must be taken to prevent marking and smearing of the freshly
7 printed or coated sheets as the sheets are transferred from one
8 printing unit to another. The printed ink on the surface of the
9 sheet dries relatively slowly and is easily smeared during subse-
10 quent transfer between printing units. Marking, smearing and
11 smudging can be prevented by a vacuum assisted sheet transfer
12 apparatus as described in the following U.S. Patents: 5,113,255;
13 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to
14 Howard W. DeMoore, co-inventor, and manufactured and sold by
15 Printing Research, Inc. of Dallas, Texas, U.S.A. under its
16 trademark BACVAC™.

17 In some printing jobs, offsetting is prevented by
18 applying a protective and/or decorative coating material over all
19 or a portion of the freshly printed sheets. Some coatings are
20 formed of a UV-curable or water-dispersed resin applied as a
21 liquid solution over the freshly printed sheets to protect the ink
22 from offsetting or set-off and improve the appearance of the
23 freshly printed sheets. Such coatings are particularly desirable
24 when decorative or protective finishes are applied in the printing
25 of posters, record jackets, brochures, magazines, folding cartons
26 and the like.

27 Description of the Prior Art

28 Various arrangements have been made for applying the
29 coating as an in-line printing operation by using the last
30 printing unit of the press as the coating application unit. For
31 example, U.S. Patents 4,270,483; 4,685,414; and 4,779,557 disclose
32 coating apparatus which can be moved into position to permit the
33 blanket cylinder of the last printing unit of a printing press to
34 be used to apply a coating material over the freshly printed

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1 sheets. In U.S. Patent 4,841,903 (Bird) there are disclosed
2 coating apparatus which can be selectively moved between the plate
3 cylinder or the blanket cylinder of the last printing unit of the
4 press so the last printing unit can only be used for coating
5 purposes. However, when coating apparatus of these types are
6 being used, the last printing unit cannot be used to print ink to
7 the sheets, but rather can only be used for the coating operation.
8 Thus, while coating with this type of in-line coating apparatus,
9 the printing press loses the capability of printing on the last
10 printing unit as it is converted to a coating unit.

11 The coater of U.S. Patent 5,107,790 (Sliker et al) is
12 retractable along an inclined rail for extending and retracting a
13 coater head into engagement with a blanket on the blanket
14 cylinder. Because of its size, the rail-retractable coater can
15 only be installed between the last printing unit of the press and
16 the delivery sheet stacker, and cannot be used for interunit
17 coating. The coater of U.S. Patent 4,615,293 (Jahn) provides two
18 separate, independent coaters located on the dampener side of a
19 converted printing unit for applying lacquer to a plate and to a
20 rubber blanket. Consequently, although a plate and blanket are
21 provided, the coating unit of Jahn's press is restricted to a
22 - dedicated coating operation only.

23 Proposals have been made for overcoming the loss of a
24 printing unit when in-line coating is used, for example as set
25 forth in U.S. Patent 5,176,077 to Howard W. DeMoore (co-inventor
26 and assignee), which discloses a coating apparatus having an
27 applicator roller positioned to apply the coating material to the
28 freshly printed sheet while the sheet is still on the last
29 impression cylinder of the press. This allows the last printing
30 unit to print and coat simultaneously, so that no loss of printing
31 unit capability results.

32 Some conventional coaters are rail-mounted and occupy a
33 large amount of press space and reduce access to the press.
34 Elaborate equipment is needed for retracting such coaters from the

operative coating position to the inoperative position, which reduces access to the printing unit.

Accordingly, there is a need for an in-line inking/coating apparatus which does not result in the loss of a printing unit, does not extend the length of the press, and which can print and coat aqueous and flexographic inks and coating materials simultaneously onto the plate and blanket on any lithographic printing unit of any lithographic printing press, including the first printing unit.

Objects of the Invention

Accordingly, a general object of the present invention is to provide improved inking/coating apparatus which is capable of selectively applying ink or coating material to a plate on a plate cylinder or ink or coating material to a plate or blanket on a blanket cylinder.

A specific object of the present invention is to provide improved inking/coating apparatus of the character described which is extendable into inking/coating engagement with either a plate on a plate cylinder or to a plate or blanket on a blanket cylinder.

A related object of the present invention is to provide improved inking/coating apparatus of the character described which is capable of being mounted on any lithographic printing unit of the press and does not interfere with operator access to the plate cylinder, blanket cylinder, or adjacent printing units.

Another object of the present invention is to provide improved inking/coating apparatus of the character described, which can be moved from an operative inking/coating engagement position adjacent to a plate cylinder or a blanket cylinder to a non-operative, retracted position.

Still another object of the present invention is to provide improved inking/coating apparatus of the character described, which can be used for applying aqueous, flexographic and ultra-violet curable inks and/or coatings in combination with

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1 lithographic, flexographic and waterless printing processes on any
2 rotary offset printing press.

3 A related object of the present invention is to provide
4 improved inking/coating apparatus of the character described,
5 which is capable of applying aqueous or flexographic ink or
6 coating material on one printing unit, for example the first
7 printing unit, and drying the ink or coating material before it is
8 printed or coated on the next printing unit so that it can be
9 overprinted or overcoated immediately on the next printing unit
10 with waterless, aqueous, flexographic or lithographic inks or
11 coating materials.

12 Yet another object of the present invention is to
13 provide improved inking/coating apparatus for use on a multiple
14 color rotary offset printing press that can apply ink or coating
15 material separately and/or simultaneously to the plate and/or
16 blanket of a printing unit of the press from a single operative
17 position, and from a single inking/coating apparatus.

18 A related object of the present invention is to provide
19 improved inking/coating apparatus of the character described, in
20 which virtually no printing unit adjustment or alteration is
21 required when the inking/coating apparatus is converted from plate
22 to blanket printing or coating and vice versa.

23 Another object of the present invention is to provide
24 improved inking/coating apparatus that can be operably mounted in
25 the dampener space of any lithographic printing unit for ink-
26 ing/coating engagement with either a plate on a plate cylinder or
27 a plate or blanket on a blanket cylinder, and which does not
28 interfere with operator movement or activities in the interunit
29 space between printing units.

30 Summary of the Invention

31 The foregoing objects are achieved by a retractable, in-
32 line inking/coating apparatus which is mounted on the dampener
33 side of any printing unit of a rotary offset press for movement
34 between an operative (on-impression) inking/coating position and

1 a retracted, disengaged (off-impression) position. The ink-
2 ing/coating apparatus includes an applicator roller which is
3 movable into and out of engagement with a plate on a plate
4 cylinder or a blanket on a blanket cylinder. The inking/coating
5 applicator head is pivotally coupled to a printing unit by pivot
6 pins which are mounted on the press side frames in the traditional
7 dampener space of the printing unit in parallel alignment with the
8 plate cylinder and the blanket cylinder. This dampener space
9 mounting arrangement allows the inking/coating unit to be
10 installed between any adjacent printing units on the press.

11 In the preferred embodiment, the applicator head
12 includes vertically spaced pairs of cradle members with one cradle
13 pair being adapted for supporting an inking/coating applicator
14 roller in alignment with a plate cylinder, and the other cradle
15 pair supporting an inking/coating applicator roller in alignment
16 with the blanket cylinder, respectively, when the applicator head
17 is in the operative position. Because of the pivotal support
18 provided by the pivot pins, the applicator head can be extended
19 and retracted within the limited space available in the tradition-
20 al dampener space, without restricting operator access to the
21 printing unit cylinders and without causing a printing unit to
22 lose its printing capability.

23 When the inking/coating apparatus is used in combination
24 with a flexographic printing plate and aqueous or flexographic ink
25 or coating material, the water component of the aqueous or
26 flexographic ink or coating material on the freshly printed or
27 coated sheet is evaporated and dried by a high velocity, hot air
28 interunit dryer and a high volume heat and moisture extractor
29 assembly so that the freshly printed ink or coating material is
30 dry before the sheet is printed or coated on the next printing
31 unit. This quick drying process permits a base layer or film of
32 ink, for example opaque white or metallic (gold, silver or other
33 metallics) ink to be printed on the first printing unit, and then
34 overprinted on the next printing unit without back-trapping or dot
35 gain.

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1 The construction and operation of the present invention
2 will be understood from the following detailed description taken
3 in conjunction with the accompanying drawings which disclose, by
4 way of example, the principles and advantages of the present
5 invention.

6 Brief Description of the Drawings

7 FIGURE 1 is a perspective view of a sheet fed, rotary
8 offset printing press having inking/coating apparatus embodying
9 the present invention;

10 FIGURE 2 is a simplified perspective view of the single
11 head, dual cradle inking/coating apparatus of the present
12 invention;

13 FIGURE 3 is a schematic side elevational view of the
14 printing press of Figure 1 having single head, dual cradle ink-
15 ing/coating apparatus installed in the traditional dampener
16 position of the first, second and last printing units;

17 FIGURE 4 is a simplified side elevational view showing
18 the single head, dual cradle inking/coating apparatus in the
19 operative inking/coating position for simultaneously printing on
20 the printing plate and blanket on the fourth printing unit;

21 FIGURE 5 is a simplified side elevational view showing
22 the single head, dual cradle inking/coating apparatus in the
23 operative position for spot or overall inking or coating on the
24 blanket of the first printing unit, and showing the dual cradle
25 inking/coating apparatus in the operative position for spot or
26 overall inking or coating on the printing plate of the second
27 printing unit;

28 FIGURE 6 is a simplified side elevational view of the
29 single head, dual cradle inking/coating apparatus of FIGURE 4 and
30 FIGURE 5, partially broken away, showing the single head, dual
31 cradle inking/coating apparatus in the operative coating position
32 and having a sealed doctor blade reservoir assembly for spot or
33 overall coating on the blanket;

1 FIGURE 7 is a schematic view showing a heat exchanger
2 and pump assembly connected to the single head, dual cradle
3 inking/coating apparatus for circulating temperature controlled
4 ink or coating material to the inking/coating apparatus;

5 FIGURE 8 is a side elevational view, partially broken
6 away, and similar to FIGURE 6 which illustrates an alternative
7 coating head arrangement;

8 FIGURE 9 is a simplified elevational view of a printing
9 unit which illustrates pivotal coupling of the inking/coating
10 apparatus on the printing unit side frame members;

11 FIGURE 10 is a view similar to FIGURE 2 in which a pair
12 of split applicator rollers are mounted in the upper cradle and
13 lower cradle, respectively;

14 FIGURE 11 is a side elevational view of a split applica-
15 tor roller;

16 FIGURE 12 is a perspective view of a doctor blade
17 reservoir which is centrally partitioned by a seal element;

18 FIGURE 13 is a sectional view showing sealing engagement
19 of the split applicator roller against the partition seal element
20 of FIGURE 12;

21 FIGURE 14 is a view similar to FIGURE 8 which illus-
22 trates an alternative inking/coating embodiment;

23 FIGURE 15 is a simplified side elevational view of a
24 substrate which has a bronzed-like finish which is applied by
25 simultaneous operation of the dual applicator roller embodiment of
26 FIGURE 14;

27 FIGURE 16 is a side elevational view, partly in section,
28 of a pan roller having separate transfer surfaces mounted on a
29 split fountain pan;

30 FIGURE 17 is a simplified side elevational view of the
31 dual cradle inking/coating apparatus, partially broken away, which
32 illustrates an alternative inking/coating head apparatus featuring
33 a single doctor blade assembly, anilox applicator roller mounted
34 on the lower cradle; and

1 FIGURE 18 is a side elevational view, partly in section,
2 of a single doctor blade anilox applicator roller assembly having
3 separate transfer surfaces, and a split fountain pan having
4 separate fountain compartments, with the separate fountain
5 compartments being supplied with different inks or coating
6 materials from separate off-press sources.

7 Detailed Description of the Preferred Embodiments

8 As used herein, the term "processed" refers to printing
9 and coating methods which can be applied to either side of a
10 substrate, including the application of lithographic, waterless,
11 UV-curable, aqueous and flexographic inks and/or coatings. The
12 term "substrate" refers to sheet and web material. Also, as used
13 herein, the term "waterless printing plate" refers to a printing
14 plate having image areas and non-image areas which are oleophilic
15 and oleophobic, respectively. "Waterless printing ink" refers to
16 an oil-based ink which does not contain a significant aqueous
17 component. "Flexographic plate" refers to a flexible printing
18 plate having a relief surface which is wettable by flexographic
19 ink or coating material. "Flexographic printing ink or coating
20 material" refers to an ink or coating material having a base
21 constituent of either water, solvent or UV-curable liquid. "UV-
22 curable lithographic printing ink and coating material" refers to
23 oil-based printing inks and coating materials that can be cured
24 (dried) photomechanically by exposure to ultraviolet radiation,
25 and that have a semi-paste or gel-like consistency. "Aqueous
26 printing ink or coating material" refers to an ink or coating
27 material that predominantly contains water as a solvent, diluent
28 or vehicle. A "relief plate" refers to a printing plate having
29 image areas which are raised relative to non-image areas which are
30 recessed.

31 As shown in the exemplary drawings, the present
32 invention is embodied in a new and improved in-line inking/coating
33 apparatus, herein generally designated 10, for applying aqueous,
34 flexographic or UV-curable inks or protective and/or decorative

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1 coatings to sheets or webs printed in a sheet-fed or web-fed,
2 rotary offset printing press, herein generally designated 12. In
3 this instance, as shown in FIGURE 1, the inking/coating apparatus
4 10 is installed in a four unit rotary offset printing press 12,
5 such as that manufactured by Heidelberger Druckmaschinen AG of
6 Germany under its designation Heidelberg Speedmaster SM102 (40",
7 102cm).

8 The press 12 includes a press frame 14 coupled at one
9 end, herein the right end, to a sheet feeder 16 from which sheets,
10 herein designated S, are individually and sequentially fed into
11 the press, and at the opposite end, with a sheet delivery stacker
12 20 in which the freshly printed sheets are collected and stacked.
13 Interposed between the sheet feeder 16 and the sheet delivery
14 stacker 20 are four substantially identical sheet printing units
15 22, 24, 26 and 28 which can print four different colors onto the
16 sheets as they are transferred through the press 12. The printing
17 units are housed within printing towers T1, T2, T3 and T4 formed
18 by side frame members 14, 15. Each printing tower has a delivery
19 side 25 and a dampener side 27. A dampener space 29 is partially
20 enclosed by the side frames on the dampener side of the printing
21 unit.

22 As illustrated, the printing units 22, 24, 26 and 28 are
23 substantially identical and of conventional design. The first
24 printing unit 22 includes an in-feed transfer cylinder 30, a plate
25 cylinder 32, a blanket cylinder 34 and an impression cylinder 36,
26 all supported for rotation in parallel alignment between the press
27 side frames 14, 15 which define printing unit towers T1, T2, T3
28 and T4. Each of the first three printing units 22, 24 and 26 have
29 a transfer cylinder 38 disposed to transfer the freshly printed
30 sheets from the adjacent impression cylinder and transfer the
31 freshly printed sheets to the next printing unit via an intermedi-
32 ate transfer drum 40.

33 The last printing unit 28 includes a delivery cylinder
34 42 mounted on a delivery shaft 43. The delivery cylinder 42
35 supports the freshly printed sheet 18 as it is transferred from

1 the last impression cylinder 36 to a delivery conveyor system,
2 generally designated 44, which transfers the freshly printed sheet
3 to the sheet delivery stacker 20. To prevent smearing during
4 transfer, a flexible covering is mounted on the delivery cylinder
5 42, as described and claimed in U.S. Patent 4,402,267 to Howard W.
6 DeMoore, which is incorporated herein by reference. The flexible
7 covering is manufactured and sold by Printing Research, Inc. of
8 Dallas, Texas, U.S.A., under its trademark SUPER BLUE®. Optional-
9 ly, a vacuum-assisted sheet transfer assembly manufactured and
10 sold by Printing Research, Inc. of Dallas, Texas, U.S.A., under
11 its trademark BACVAC® can be substituted for the delivery transfer
12 cylinder 42 and flexible covering.

13 The delivery conveyor system 44 as shown in FIGURE 2 is
14 of conventional design and includes a pair of endless delivery
15 gripper chains 46, only one of which is shown carrying at regular
16 spaced locations along the chains, laterally disposed gripper bars
17 having gripper fingers used to grip the leading edge of a freshly
18 printed or coated sheet 18 after it leaves the nip between the
19 impression cylinder 36 and delivery cylinder 42 of the last
20 printing unit 28. As the leading edge is gripped by the gripper
21 fingers, the delivery chains 46 pull the sheet away from the last
22 impression cylinder 36 and convey the freshly printed or coated
23 sheet to the sheet delivery stacker 20.

24 Prior to reaching the delivery sheet stacker, the
25 freshly printed and/or coated sheets S pass under a delivery dryer
26 48 which includes a combination of infra-red thermal radiation,
27 high velocity hot air flow and a high performance heat and
28 moisture extractor for drying the ink and/or the protec-
29 tive/decorative coating. Preferably, the delivery dryer 48,
30 including the high performance heat and moisture extractor is
31 constructed as described in U.S. Application Serial Number
32 08/116,711, filed September 3, 1993, entitled "Infra-Red Forced
33 Air Dryer and Extractor" by Howard C. Secor, Ronald M. Rendleman
34 and Paul D. Copenhagen, commonly assigned to the assignee of the
35 present invention, Howard W. DeMoore, and licensed to Printing

1 Research, Inc. of Dallas, Texas, U.S.A., which manufactures and
2 markets the delivery dryer 48 under its trademark AIR BLANKET™.

3 In the exemplary embodiment shown in FIGURE 3, the first
4 printing unit 22 has a flexographic printing plate PF mounted on
5 the plate cylinder, and therefore neither an inking roller train
6 nor a dampening system is required. A flexographic printing plate
7 PF is also mounted on the plate cylinder of the second printing
8 unit 24. The form rollers of the inking roller train 52 shown
9 mounted on the second printing unit 24 are retracted and locked
10 off to prevent plate contact. Flexographic ink is supplied to the
11 flexographic plate PF of the second printing unit 24 by the ink-
12 ing/coating apparatus 10.

13 A suitable flexographic printing plate PF is offered by
14 E.I. du Pont de Nemours of Wilmington, Delaware, U.S.A., under its
15 trademark CYREL®. Another source is BASF Aktiengesellschaft of
16 Ludwigshafen, Germany, which offers a suitable flexographic
17 printing plate under its trademark NYLOFLEX®.

18 The third printing unit 26 as illustrated in FIGURE 3
19 and FIGURE 4 is equipped for lithographic printing and includes an
20 inking apparatus 50 having an inking roller train 52 arranged to
21 transfer ink Q from an ink fountain 54 to a lithographic plate P
22 mounted on the plate cylinder 32. This is accomplished by a
23 fountain roller 56 and a ductor roller 57. The fountain roller 56
24 projects into the ink fountain 54, whereupon its surface picks up
25 ink. The lithographic printing ink Q is transferred from the
26 fountain roller 56 to the inking roller train 52 by the ductor
27 roller 57. The inking roller train 52 supplies ink Q to the image
28 areas of the lithographic printing plate P.

29 The lithographic printing ink Q is transferred from the
30 lithographic printing plate P to an ink receptive blanket B which
31 is mounted on the blanket cylinder 34. The inked image carried on
32 the blanket B is transferred to a substrate S as the substrate is
33 transferred through the nip between the blanket cylinder 34 and
34 the impression cylinder 36.

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1 The inking roller arrangement 52 illustrated in FIGURE
2 3 and FIGURE 4 is exemplary for use in combination with litho-
3 graphic ink printing plates P. It is understood that a dampening
4 system 58 having a dampening fluid reservoir DF is coupled to the
5 inking roller train 52 (FIGURE 4), but is not required for water-
6 less or flexographic printing.

7 The plate cylinder 32 of printing unit 28 is equipped
8 with a waterless printing plate PW. Waterless printing plates are
9 also referred to as dry planographic printing plates and are
10 disclosed in the following U.S. patents: 3,910,187; Re. 30,670;
11 4,086,093; and 4,853,313. Suitable waterless printing plates can
12 be obtained from Toray Industries, Inc. of Tokyo, Japan. A
13 dampening system is not used for waterless printing, and waterless
14 (oil-based) printing ink is used. The waterless printing plate PW
15 has image areas and non-image areas which are oleophilic/hydro-
16 philic and oleophobic/hydrophobic, respectively. The waterless
17 printing plate PW is engraved or etched, with the image areas
18 being recessed with respect to the non-image areas. The image
19 area of the waterless printing plate PW is rolled-up with the
20 flexographic or aqueous printing ink which is transferred by the
21 applicator roller 66. Both aqueous and oil-based inks and
22 coatings are repelled from the non-image areas, and are retained
23 in the image areas. The printing ink or coating is then trans-
24 ferred from the image areas to an ink or coating receptive blanket
25 B and is printed or coated onto a substrate S.

26 For some printing jobs, a flexographic plate PF or a
27 waterless printing plate PW is mounted over a resilient packing
28 such as the blanket B on the blanket cylinder 34, for example as
29 indicated by phantom lines in printing unit 22 of FIGURE 5. An
30 advantage of this alternative embodiment is that the waterless
31 plate PW or the flexographic plate PF are resiliently supported
32 over the blanket cylinder by the underlying blanket B or other
33 resilient packing. The radial deflection and give of the
34 resilient blanket B provides uniform, positive engagement between

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1 the applicator roller 66 and a flexographic plate or waterless
2 plate.

3 In that arrangement, a plate is not mounted on the plate
4 cylinder 32; instead, a waterless plate PW is mounted on the
5 blanket cylinder, and the inked image on the waterless printing
6 plate is not offset but is instead transferred directly from the
7 waterless printing plate PW to the substrate S. The water
8 component of flexographic ink on the freshly printed sheet is
9 evaporated by high velocity, hot air dryers and high volume heat
10 and moisture extractors so that the freshly printed aqueous or
11 flexographic ink is dried before the substrate is printed on the
12 next printing unit.

13 Referring now to FIGURE 2, FIGURE 3 and FIGURE 9, the
14 inking/coating apparatus 10 is pivotally mounted on the side
15 frames 14, 15 for rotation about an axis X. The inking/coating
16 apparatus 10 includes a frame 60, a hydraulic motor 62, a lower
17 gear train 64, an upper gear train 65, an applicator roller 66, a
18 sealed doctor blade assembly 68 (FIGURE 6), and a drip pan DP, all
19 mounted on the frame 60. The external peripheral surface of the
20 applicator roller 66 is wetted by contact with liquid coating
21 material or ink contained in a reservoir 70.

22 The hydraulic motor 62 drives the applicator roller 66
23 synchronously with the plate cylinder 32 and the blanket cylinder
24 34 in response to an RPM control signal from the press drive (not
25 illustrated) and a feedback signal developed by a tachometer 72.
26 While a hydraulic drive motor is preferred, other drive means such
27 as an electric drive motor or an equivalent can be used.

28 When using waterless printing plate systems, the
29 temperature of the waterless printing ink and of the waterless
30 printing plate must be closely controlled for good image reproduc-
31 tion. For example, for waterless offset printing with TORAY
32 waterless printing plates PW, it is absolutely necessary to
33 control the waterless printing plate surface and waterless ink
34 temperature to a very narrow range, for example 24°C (75°F) to
35 27°C (80°F).

1 Referring to FIGURE 7, the reservoir 70 is supplied with
2 ink or coating which is temperature controlled by a heat exchanger
3 71. The temperature controlled ink or coating material is
4 circulated by a positive displacement pump, for example a
5 peristaltic pump, through the reservoir 70 and heat exchanger 71
6 from a source 73 through a supply conduit 75 and a return conduit
7 77. The heat exchanger 71 cools or heats the ink or coating
8 material and maintains the ink or coating and the printing plate
9 within the desired narrow temperature range.

10 According to one aspect of the present invention,
11 aqueous/flexographic ink or coating material is supplied to the
12 applicator roller 66, which transfers the aqueous/flexographic ink
13 or coating material to the printing plate (FIGURE 7), which may be
14 a waterless printing plate or a flexographic printing plate. When
15 the inking/coating apparatus is used for applying aque-
16 ous/flexographic ink or coating material to a waterless printing
17 plate PW, the inking roller train 52 is not required, and is
18 retracted away from the printing plate. Because the viscosity of
19 aqueous/flexographic printing ink or coating material varies with
20 temperature, it is necessary to heat or cool the aque-
21 ous/flexographic printing ink or coating material to compensate
22 for ambient temperature variations to maintain the ink viscosity
23 in a preferred operating range.

24 For example, the temperature of the printing press can
25 vary from around 60°F (15°C) in the morning, to around 85°F (29°C)
26 or more in the afternoon. The viscosity of aqueous/flexographic
27 printing ink or coating material can be marginally high when the
28 ambient temperature of the press is near 60°F (15°C), and the
29 viscosity can be marginally low when the ambient temperature of
30 the press exceeds 85°F (29°C). Consequently, it is desirable to
31 control the temperature of the aqueous/flexographic printing ink
32 or coating material so that it will maintain the surface tempera-
33- ture of waterless printing plates within the specified temperature
34 range. Moreover, the ink/coating material temperature should be
35 controlled to maintain the tack of the aqueous/flexographic

1 printing ink or coating material within a desired range when the
2 ink or coating material is being used in connection with flexo-
3 graphic printing processes.

4 The applicator roller 66 is preferably an anilox fluid
5 metering roller which transfers measured amounts of printing ink
6 or coating material to a plate or blanket. The surface of an
7 anilox roller is engraved with an array of closely spaced, shallow
8 depressions referred as "cells". Ink or coating from the
9 reservoir 70 flows into the cells as the anilox roller turns
10 through the reservoir. The transfer surface of the anilox roller
11 is "doctored" (wiped or scraped) by dual doctor blades 68A, 68B to
12 remove excess ink or coating material. The ink or coating metered
13 by the anilox roller is that contained within the cells. The dual
14 doctor blades 68A, 68B also seal the supply reservoir 70.

15 The anilox applicator roller 66 is cylindrical and may
16 be constructed in various diameters and lengths, containing cells
17 of various sizes and shapes. The volumetric capacity of an anilox
18 roller is determined by cell size, shape and number of cells per
19 unit area. Depending upon the intended application, the cell
20 pattern may be fine (many small cells per unit area) or coarse
21 (fewer large cells per unit area).

22 By supplying the ink or coating material through the
23 inking/coating apparatus 10, more ink or coating material can be
24 applied to the sheet S as compared with the inking roller train of
25 a lithographic printing unit. Moreover, color intensity is
26 stronger and more brilliant because the aqueous or flexographic
27 ink or coating material is applied at a much heavier film
28 thickness or weight than can be applied by the lithographic
29 process, and the aqueous or flexographic colors are not diluted by
30 dampening solution.

31 Preferably, the sealed doctor blade assembly 68 is con-
32 structed as described in U.S. Patent 5,176,077 to Howard W.
33 DeMoore, co-inventor and assignee, which is incorporated herein by
34 reference. An advantage of using a sealed reservoir is that fast
35 drying ink or coating material can be used. Fast drying ink or

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1 coating material can be used in an open fountain 53 (see FIGURE
2 8); however, open air exposure causes the water and solvents in
3 the fast-drying ink or coating material to evaporate faster, thus
4 causing the ink or coating material to dry prematurely and change
5 viscosity. Moreover, an open fountain emits unwanted odors into
6 the press room. When the sealed doctor blade assembly is
7 utilized, the pump (FIGURE 7) which circulates ink or coating
8 material to the doctor blade head is preferably a peristaltic
9 pump, which does not inject air into the feeder lines which supply
10 the ink or coating reservoir 70 and helps to prevent the formation
11 of air bubbles and foam within the ink or coating material.

12 An inking/coating apparatus 10 having an alternative
13 applicator roller arrangement is illustrated in FIGURES 10-13. In
14 this arrangement, the engraved metering surface of the anilox
15 applicator rollers 66, 67 are partitioned by smooth seal surfaces
16 66C which separates a first engraved peripheral surface portion
17 66A from a second engraved peripheral surface portion 66B.
18 Likewise, smooth seal surfaces 66D, 66E are formed on the opposite
19 end portions of the applicator roller 66 for engaging end seals
20 134, 136 (FIGURE 12) of the doctor blade reservoir. The upper
21 applicator roller 67 has engraved anilox metering surfaces 67A and
22 67B which are separated by a smooth seal band 67C.

23 Referring now to FIGURE 12 and FIGURE 13, the reservoir
24 70 of the doctor blade head 68 is partitioned by a curved seal
25 element 130 to form two separate chambers 70A, 70B. The seal
26 element 130 is secured to the doctor blade head within an annular
27 groove 132. The seal element 130 is preferably made of polyur-
28 ethane foam or other durable, resilient foam material. The seal
29 element 130 is engaged by the seal band 66, thus forming a rotary
30 seal which blocks the leakage of ink or coating material from one
31 reservoir chamber into the other reservoir chamber. Moreover, the
32 seal band provides an unprinted or uncoated area which separates
33 the printed or coated areas from each other, which is needed for
34 work and turn printing jobs or other printing jobs which print two
35 or more separate images onto the same substrate.

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1 Another advantage of the split applicator roller
2 embodiment is that it enables two or more flexographic inks or
3 coating materials to be printed simultaneously within the same
4 lithographic printing unit. That is, the reservoir chambers 70A,
5 70B of the upper doctor blade assembly can be supplied with gold
6 ink and silver ink, for example, while the reservoir chambers 70A,
7 70B of the lower doctor blade assembly can be supplied with inks
8 of two additional colors, for example opaque white ink and blue
9 ink. This permits the opaque white ink to be overprinted with the
10 gold ink, and the blue ink to be overprinted with the silver ink
11 on the same printing unit on any lithographic press.

12 Moreover, a catalyst can be used in the upper doctor
13 blade reservoir and a reactive ink or coating material can be used
14 in the lower doctor blade reservoir. This can provide various
15 effects, for example improved chemical resistance and higher gloss
16 levels.

17 The split applicator roller sections 67A, 67B in the
18 upper cradle position can be used for applying two separate inks
19 or coating materials simultaneously, for example flexographic,
20 aqueous and ultra-violet curable inks or coating materials, to
21 separate surface areas of the plate, while the lower applicator
22 roller sections 66A, 66B can apply an initiator layer and a micro-
23 encapsulated layer simultaneously to separate blanket surface
24 areas. Optionally, the metering surface portions 66A, 66B can be
25 provided with different cell metering capacities for providing
26 different printing effects which are being printed simultaneously.
27 For example, the screen line count on one half-section of an
28 anilox applicator roller is preferably in the range of 200-600
29 lines per inch (79-236 lines per cm) for half-tone images, and the
30 screen line count of the other half-section is preferably in the
31 range of 100-300 lines per inch (39-118 lines per cm) for overall
32 coverage, high weight applications such as opaque white. This
33 split arrangement in combination with dual applicator rollers is
34 particularly advantageous when used in connection with "work and
35 turn" printing jobs.

1 Referring again to FIGURE 8, instead of using the sealed
2 doctor blade reservoir assembly 68 as shown in FIGURE 6, an open
3 fountain assembly 69 is provided by the fountain pan 53 which
4 contains a volume of liquid ink Q or coating material. The liquid
5 ink or coating material is transferred to the applicator roller 66
6 by a pan roller 55 which turns in contact with ink Q or coating
7 material in the fountain pan. If a split applicator roller is
8 used, the pan roller 55 is also split, and the pan is divided into
9 two pan sections 53A, 53B by a separator plate 53P, as shown in
10 FIGURE 16.

11 In the alternative embodiment of FIGURE 16, the pan
12 roller 55 is divided into two pan roller sections 55A, 55B by a
13 centrally located, annular groove 59. The separator plate 53P is
14 received within and centrally aligned with the groove 59, but does
15 not touch the adjoining roller faces. By this arrangement, two or
16 more inks or coating materials Q1, Q2 are contained within the
17 open pan sections 55A, 55B for transfer by the split pan roller
18 sections 53A, 53B, respectively. This permits two or more
19 flexographic inks or coating materials to be transferred to two
20 separate image areas on the plate or on the blanket of the same
21 printing unit. This arrangement is particularly advantageous for
22 work and turn printing jobs or other printing jobs which print two
23 or more separate images onto the same substrate.

24 The frame 60 of the inking/coating apparatus 10 includes
25 side support members 74, 76 which support the applicator roller
26 66, gear train 64, gear train 65, doctor blade assembly 68 and the
27 drive motor 62. The applicator roller 66 is mounted on stub
28 shafts 63A, 63B which are supported at opposite ends on a lower
29 cradle assembly 100 formed by a pair of side support members 78,
30 80 which have sockets 79, 81 and retainer caps 101, 103. The stub
31 shafts are received in roller bearings 105, 107 which permit free
32 rotation of the applicator roller 66 about its longitudinal axis
33 A1 (axis A2 in the upper cradle). The retainer caps 101, 103 hold
34 the stub shafts 63A, 63B and bearings 105, 107 in the sockets 79,

1 81 and hold the applicator roller 66 in parallel alignment with
2 the pivot axis X.

3 The side support members 74, 76 also have an upper
4 cradle assembly 102 formed by a pair of side support members 82,
5 84 which are vertically spaced with respect to the lower side
6 plates 78, 80. Each cradle 100, 102 has a pair of sockets 79, 81
7 and 83, 85, respectively, for holding an applicator roller 66, 67
8 for spot coating or inking engagement with the printing plate P on
9 the plate cylinder 32 (FIGURE 4) or with a printing plate P or a
10 blanket B on the blanket cylinder 34.

11 Preferably, the applicator roller 67 (FIGURE 8, FIGURE
12 9) the upper cradle (plate) position is an anilox roller having a
13 resilient transfer surface. In the dual cradle arrangement as
14 shown in FIGURE 2, the press operator can quickly change from
15 blanket inking/coating to plate inking/coating within minutes,
16 since it is only necessary to release, remove and reposition or
17 replace the applicator roller 66.

18 The capability to simultaneously print in the flexo-
19 graphic mode, the aqueous mode, the waterless mode, or the litho-
20 graphic mode on different printing units of the same lithographic
21 press and to print or coat from either the plate position or the
22 blanket position on any one of the printing units is referred to
23 herein as the LITHOFLEX™ printing process or system. LITHOFLEX™
24 is a trademark of Printing Research, Inc. of Dallas, Texas,
25 U.S.A., exclusive licensee of the present invention.

26 Referring now to FIGURE 14, an inking/coating apparatus
27 10 having an inking/coating assembly 109 of an alternative design
28 is installed in the upper cradle position for applying ink and/or
29 coating material to a plate P on the plate cylinder 32. According
30 to this alternative embodiment, an applicator roller 67R having a
31 resilient transfer surface is coupled to an anilox fluid metering
32 roller which transfers measured amounts of printing ink or coating
33 material to the plate P. The anilox roller 111 has a transfer
34 surface constructed of metal, ceramic or composite material which
35 is engraved with cells. The resilient applicator roller 67R is

1 interposed in transfer engagement with the plate P and the
2 metering surface of the anilox roller 111. The resilient transfer
3 surface of the applicator roller 67R provides uniform, positive
4 engagement with the plate.

5 Referring now to FIGURE 17, an inking/coating apparatus
6 10 having an alternative inking/coating assembly 113 is installed
7 in the lower cradle assembly 100 for applying flexographic or
8 aqueous ink and/or coating material Q to a plate or blanket
9 mounted on the blanket cylinder 34. Instead of using the sealed,
10 dual doctor blade reservoir assembly 68 as shown in FIGURE 6, an
11 open, single doctor blade anilox roller assembly 113 is supplied
12 with liquid ink Q or coating material contained in an open
13 fountain pan 117. The liquid ink or coating material Q is
14 transferred to the engraved transfer surface of the anilox roller
15 66 as it turns in the fountain pan 117. Excess ink or coating
16 material Q is removed from the engraved transfer surface by a
17 single doctor blade 68B. The liquid ink or coating material Q is
18 pumped from an off-press source, for example the drum 73 shown in
19 FIGURE 17, through a supply conduit 119 into the fountain pan 117
20 by a pump 120.

21 For overall inking or coating jobs, the metering
22 transfer surface of the anilox roller 66 extends over its entire
23 peripheral surface. However, for certain printing jobs which
24 print two or more separate images onto the same substrate, for
25 example work and turn printing jobs, the metering transfer surface
26 of the anilox applicator roller 66 is partitioned by a centrally
27 located, annular undercut groove 66C which separates first and
28 second metering transfer surfaces 66A, 66B as shown in FIGURE 11
29 and FIGURE 18.

30 The single doctor blade 68B has an edge 68E which wipes
31 simultaneously against the split metering transfer surfaces 66A,
32 66B. In this single blade, split anilox roller embodiment 113, it
33 is necessary to provide dual supply sources, for example drums
34 73A, 73B, dual supply lines 119A, 119B, and dual pumps 120A, 120E.
35 Moreover, the fountain pan 117 is also split, and the pan 117 is

1 divided into two pan sections 117A, 117B by a separator plate 121,
2 as shown in FIGURE 18. The separator plate 121 is centrally
3 aligned with the undercut groove 66C, but does not touch the
4 adjoining roller faces.

5 Although the single blade, split anilox applicator
6 roller assembly 113 is shown mounted in the lower cradle position
7 (FIGURE 17), it should be understood that the single blade, split
8 anilox applicator roller assembly 113 can be mounted and used in
9 the upper cradle position, as well.

10 According to another aspect of the present invention,
11 the inking/coating apparatus 10 is pivotally coupled on horizontal
12 pivot pins 88P, 90P which allows the single head, dual cradle ink-
13 ing/coating apparatus 10 to be mounted on any lithographic
14 printing unit. Referring to FIGURE 9, the horizontal pivot pins
15 88P, 90P are mounted within the traditional dampener space 29 of
16 the printing unit and are secured to the press side frames 14, 15,
17 respectively. Preferably, the pivot support pins 88P, 90P are
18 secured to the press side frames by a threaded fastener. The
19 pivot support pins are received within circular openings 88, 90
20 which intersect the side support members 74, 76 of the ink-
21 ing/coating apparatus 10. The horizontal support pins 88P, 90P
22 are disposed in parallel alignment with rotational axis X and with
23 the plate cylinder and blanket cylinder, and are in longitudinal
24 alignment with each other.

25 Preferably, the pivot pins 88P, 90P are located in the
26 dampener space 29 so that the rotational axes A1, A2 of the
27 applicator rollers 66, 67 are elevated with respect to the nip
28 contact points N1, N2. By that arrangement, the transfer point
29 between the applicator roller 66 and a blanket on the blanket
30 cylinder 34 (as shown in FIGURE 8) and the transfer point between
31 the applicator roller 66 and a plate on the plate cylinder 32 (as
32 shown in FIGURE 5) are above the radius lines R1, R2 of the plate
33 cylinder and the blanket cylinder, respectively. This permits the
34 inking/coating apparatus 10 to move clockwise to retract the
35 applicator roller 66 to an off-impression position relative to the

1 blanket cylinder in response to a single extension stroke of the
2 power actuator arms 104A, 106A. Similarly, the applicator roller
3 66 is moved counterclockwise to the on-impression operative
4 position as shown in FIGURES 4, 5, 6 and 8 by a single retraction
5 stroke of the actuator arms 104A, 106A, respectively.

6 Preferably, the pivot pins are made of steel and the
7 side support members are made of aluminum, with the steel pivot
8 pins and the aluminum collar portion bordering the circular
9 openings 88, 90 forming a low friction journal. By this arrange-
10 ment, the inking/coating apparatus 10 is freely rotatable
11 clockwise and counterclockwise with respect to the pivot pins 88P,
12 90P. Typically, the arc length of rotation is approximately 60
13 mils (about 1.5 mm). Consequently, the inking/coating apparatus
14 10 is almost totally enclosed within the dampener space 29 of the
15 printing unit in the on-impression position and in the off-
16 impression position.

17 The cradle assemblies 100 and 102 position the applica-
18 tor roller 66 in inking/coating alignment with the plate cylinder
19 or blanket cylinder, respectively, when the inking/coating
20 apparatus 10 is extended to the operative (on-impression)
21 position. Moreover, because the inking/coating apparatus 10 is
22 installed within the dampener space 29, it is capable of freely
23 rotating through a small arc while extending and retracting
24 without being obstructed by the press side frames or other parts
25 of the printing press. This makes it possible to install the ink-
26 ing/coating apparatus 10 on any lithographic printing unit.
27 Moreover, because of its internal mounting position within the
28 dampener space 29, the projection of the inking/coating apparatus
29 10 into the space between printing units is minimal. This assures
30 unrestricted operator access to the printing unit when the
31 applicator head is in the operative (on-impression) and retracted
32 (off-impression) positions.

33 As shown in FIGURE 4 and FIGURE 5, movement of the
34 inking/coating apparatus 10 is counterclockwise from the retracted

1 (off-impression) position to the operative (on-impression)
2 position.

3 Although the dampener side installation is preferred,
4 the inking/coating apparatus 10 can be adapted for operation on
5 the delivery side of the printing unit, with the inking/coating
6 apparatus being movable from a retracted (off-impression) position
7 to an on-impression position for engagement of the applicator
8 roller with either a plate on the plate cylinder or a blanket on
9 the blanket cylinder on the delivery side 25 of the printing unit.

10 Movement of the inking/coating apparatus 10 to the
11 operative (on-impression) position is produced by power actuators,
12 preferably double acting pneumatic cylinders 104, 106 which have
13 extendable/retractable power transfer arms 104A, 106A, respective-
14 ly. The first pneumatic cylinder 104 is pivotally coupled to the
15 press frame 14 by a pivot pin 108, and the second pneumatic
16 cylinder 106 is pivotally coupled to the press frame 15 by a pivot
17 pin 110. In response to selective actuation of the pneumatic
18 cylinders 104, 106, the power transfer arms 104A, 106A are
19 extended or retracted. The power transfer arm 104A is pivotally
20 coupled to the side support member 74 by a pivot pin 112.
21 Likewise, the power transfer arm 106A is pivotally coupled to the
22 side support member 76 by a pivot pin 114.

23 As the power arms extend, the inking/coating apparatus
24 10 is rotated clockwise on the pivot pins 88P, 90P, thus moving
25 the applicator roller 66 to the off-impression position. As the
26 power arms retract, the inking/coater apparatus 60 is rotated
27 counterclockwise on the pivot pins 88P, 90P, thus moving the
28 applicator roller 66 to the on-impression position. The torque
29 applied by the pneumatic actuators is transmitted to the ink-
30 ing/coating apparatus 10 through the pivot pin 112 and pivot pin
31 114.

32 Fine adjustment of the on-impression position of the
33 applicator roller relative to the plate cylinder or the blanket
34 cylinder, and of the pressure of roller engagement, is provided by
35 an adjustable stop assembly 115. The adjustable stop assembly 115

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1 has a threaded bolt 116 which is engagable with a bell crank 118.
2 The bell crank 118 is pivotally coupled to the side support member
3 74 on a pin 120. One end of the bell crank 118 is engagable by
4 the threaded bolt 116, and a cam roller 122 is mounted for
5 rotation on its opposite end. The striking point of engagement is
6 adjusted by rotation of the bolt 116 so that the applicator roller
7 66 is properly positioned for inking/coating engagement with the
8 plate P or blanket B and provides the desired amount of ink-
9 ing/coating pressure when the inking/coating assembly 60 is moved
10 to the operative position.

11 This arrangement permits the in-line inking/coating
12 apparatus to operate effectively without encroaching in the
13 interunit space between any adjacent printing units, and without
14 blocking or obstructing access to the cylinders of the printing
15 units when the inking/coating apparatus is in the extended (off-
16 impression) position or retracted (on-impression) position.
17 Moreover, when the in-line inking/coating apparatus is in the
18 retracted position, the doctor blade reservoir and coating
19 circulation lines can be drained and flushed automatically while
20 the printing press is running as well as when the press has been
21 stopped for change-over from one job to another or from one type
22 of ink or coating to another.

23 Substrates which are printed or coated with aqueous
24 flexographic printing inks require high velocity hot air for
25 drying. When printing a flexographic ink such as opaque white or
26 metallic gold, it is always necessary to dry the printed sub-
27 strates between printing units before overprinting them.
28 According to the present invention, the water component on the
29 surface of the freshly printed or coated substrate S is evaporated
30 and dried by high velocity, hot air interunit dryer and high
31 volume heat and moisture extractor units 124, 126 and 128, as
32 shown in FIGURE 2, FIGURE 4 and FIGURE 5. The dryer/extractor
33 units 124, 126 and 128 are oriented to direct high velocity heated
34 air onto the freshly printed/coated substrates as they are
35 transferred by the impression cylinder 36 and the intermediate

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1 transfer drum 40 of one printing unit and to another transfer
2 cylinder 30 and to the impression cylinder 36 of the next printing
3 unit. By that arrangement, the freshly printed flexographic ink
4 or coating material is dried before the substrate S is overprinted
5 by the next printing unit.

6 The high velocity, hot air dryer and high performance
7 heat and moisture extractor units 124, 126 and 128 utilize high
8 velocity air jets which scrub and break-up the moist air layer
9 which clings to the surface of each freshly printed or coated
10 sheet or web. Within each dryer, high velocity air is heated as
11 it flows across a resistance heating element within an air
12 delivery baffle tube. High velocity jets of hot air are dis-
13 charged through multiple airflow apertures into an exposure zone
14 Z (FIGURE 4 and FIGURE 3) and onto the freshly printed/coated
15 sheet S as it is transferred by the impression cylinder 36 and
16 transfer drum 40, respectively.

17 Each dryer assembly includes a pair of air delivery
18 dryer heads 124D, 126D and 128D which are arranged in spaced,
19 side-by-side relationship. The high velocity, hot air dryer and
20 high performance heat and moisture extractor units 124, 126 and
21 128 are preferably constructed as disclosed in co-pending U.S.
22 Patent Application Serial No. 08/132,584, filed October 6, 1993,
23 entitled "High Velocity Hot Air Dryer", to Howard W. DeMoore, co-
24 inventor and assignee of the present invention, and which is
25 incorporated herein by reference, and which is marketed by
26 Printing Research, Inc. of Dallas, Texas, U.S.A., under its
27 trademark SUPER BLUE HV™.

28 The hot moisture-laden air displaced from the surface of
29 each printed or coated sheet is extracted from the dryer exposure
30 zone Z and exhausted from the printing unit by the high volume
31 extractors 124, 126 and 128. Each extractor head includes an
32 extractor manifold 124E, 126E and 128E coupled to the dryer heads
33 124D, 126D and 128D and draws the moisture, volatiles, odors and
34 hot air through a longitudinal air gap G between the dryer heads.
35 Best results are obtained when extraction is performed simulta-

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1 neously with drying. Preferably, an extractor is closely coupled
2 to the exposure zone Z at each dryer location as shown in FIGURE
3 4. Extractor heads 124E, 126E and 128E are mounted on the dryer
4 heads 124D, 126D and 128D, respectively, with the longitudinal
5 extractor air gap G facing directly into the exposure zone Z.
6 According to this arrangement, each printed or coated sheet is
7 dried before it is printed on the next printing unit.

8 The aqueous water-based inks used in flexographic
9 printing evaporate at a relatively moderate temperature provided
10 by the interunit high velocity hot air dryers/extractors 124, 126
11 and 128. Sharpness and print quality are substantially improved
12 since the flexographic ink or coating material is dried before it
13 is overprinted on the next printing unit. Since the freshly
14 printed flexographic ink is dry, dot gain is substantially reduced
15 and back-trapping on the blanket of the next printing unit is
16 virtually eliminated. This interunit drying/extracting arrange-
17 ment makes it possible to print flexographic inks such as metallic
18 ink and opaque white ink on the first printing unit, and then dry-
19 trap and overprint on the second and subsequent printing units.

20 Moreover, this arrangement permits the first printing
21 unit 22 to be used as a coater in which a flexographic, aqueous or
22 UV-curable coating material is applied to the lowest grade
23 substrate such as recycled paper, cardboard, plastic and the like,
24 to trap and seal-in lint, dust, spray powder and other debris and
25 provide a smoother, more durable printing surface which can be
26 overprinted on the next printing unit.

27 A first down (primer) aqueous coating layer seals-in the
28 surface of a low grade, rough substrate, for example, re-cycled
29 paper or plastic, and improves overprinted dot definition and
30 provides better ink lay-down while preventing strike-through and
31 show-through. A flexographic UV-curable coating material can then
32 be applied downstream over the primer coating, thus producing
33 higher coating gloss.

34 Preferably, the applicator roller 66 is constructed of
35 composite carbon fiber material, metal or ceramic coated metal

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1 when it is used for applying ink or coating material to the
2 blanket B or other resilient material on the blanket cylinder 34.
3 When the applicator roller 66 is applied to the plate, it is
4 preferably constructed as an anilox roller having a resilient,
5 compressible transfer surface. Suitable resilient roller surface
6 materials include Buna N synthetic rubber and EPDM (terpolymer
7 elastomer).

8 It has been demonstrated in prototype testing that the
9 inking/coating apparatus 10 can apply a wide range of ink and
10 coating types, including fluorescent (Day Glo), pearlescent,
11 metallics (gold, silver and other metals), glitter, scratch and
12 sniff (micro-encapsulated fragrance), scratch and reveal,
13 luminous, pressure-sensitive adhesives and the like, as well as
14 UV-curable and aqueous coatings.

15 With the dampener assembly removed from the printing
16 unit, the inking/coating apparatus 10 can easily be installed in
17 the dampener space for selectively applying flexographic inks
18 and/or coatings to a flexographic or waterless printing plate or
19 to the blanket. Moreover, overprinting of the flexographic inks
20 and coatings can be performed on the next printing unit since the
21 flexographic inks and/or coatings are dried by the high velocity,
22 hot air interunit dryer and high volume heat and moisture
23 extractor assembly of the present invention.

24 The flexographic inks and coatings as used in the
25 present invention contain colored pigments and/or soluble dyes,
26 binders which fix the pigments onto the surface of the substrate,
27 waxes, defoamers, thickeners and solvents. Aqueous printing inks
28 predominantly contain water as a diluent and/or vehicle. The
29 thickeners which are preferred include algonates, starch,
30 cellulose and its derivatives, for example cellulose esters or
31 cellulose ethers and the like. Coloring agents including organic
32 as well as inorganic pigments may be derived from dyes which are
33 insoluble in water and solvents. Suitable binders include
34 acrylates and/or polyvinylchloride.

1 When metallic inks are printed, the cells of the anilox
2 roller must be appropriately sized to prevent the metal particles
3 from getting stuck within the cells. For example, for metallic
4 gold ink, the anilox roller should have a screen line count in the
5 range of 175-300 lines per inch (68-118 lines per cm). Prefera-
6 bly, in order to keep the anilox roller cells clear, the doctor
7 blade assembly 68 is equipped with a bristle brush BR (FIGURE 14),
8 as set forth in U.S. Patent 5,425,809 to Steven M. Person,
9 assigned to Howard W. DeMoore, and licensed to Printing Research,
10 Inc. of Dallas, Texas, U.S.A., which is incorporated herein by
11 reference.

12 The inking/coating apparatus 10 can also apply UV-
13 curable inks and coatings. If UV-curable inks and coatings are
14 utilized, ultra-violet dryers/extractors are installed adjacent to
15 the high velocity hot air dryer/extractor units 124, 126 and 128,
16 respectively.

17 It will be appreciated that the LITHOFLEX™ printing
18 process described herein makes it possible to selectively operate
19 a printing unit of a press in the lithographic printing mode while
20 simultaneously operating another printing unit of the same press
21 in either the flexographic printing mode or in the waterless
22 printing mode, while also providing the capability to print or
23 coat, separately or simultaneously, from either the plate position
24 or the blanket position. The dual cradle support arrangement of
25 the present invention makes it possible to quickly change over
26 from inking/coating on the blanket cylinder position to ink-
27 ing/coating on the plate cylinder position with minimum press
28 down-time, since it is only necessary to remove and reposition or
29 replace the applicator roller 66 while the inking/coating
30 apparatus 10 is in the retracted position. It is only necessary
31 to remove four cap screws, lift the applicator roller 66 from the
32 cradle, and reposition it in the other cradle. All of this can be
33 accomplished in a few minutes, without removing the inking/coating
34 apparatus 10 from the press.

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1 It is possible to spot coat or overall coat from the
2 plate position or from the blanket position with flexographic inks
3 or coatings on one printing unit and then spot coat or overall
4 coat with UV-curable inks or coatings from the plate position or
5 from the blanket position on another printing unit during the same
6 press run. Moreover, the press operator can spot or overall coat
7 from the plate for one job, and then spot and/or overall coat from
8 the blanket on the next job.

9 The positioning of the applicator roller relative to the
10 plate or blanket is repeatable to a predetermined preset operative
11 position. Consequently, only minor printing unit modifications or
12 alterations may be required for the LITHOFLEX™ process. Although
13 automatic extension and retraction have been described in
14 connection with the exemplary embodiment, extension to the
15 operative (on-impression) position and retraction to a non-
16 operative (off-impression) position can be carried out manually,
17 if desired. In the manual embodiment, it is necessary to latch
18 the inking/coating apparatus 10 to the press side frames 14, 15 in
19 the operative (on-impression) position, and to mechanically prop
20 the inking/coating apparatus in the off-impression (retracted)
21 position.

22 Referring again to FIGURE 8, an applicator roller 66 is
23 mounted on the lower cradle assembly 100 by side support members
24 78, 80, and a second applicator roller 66 is mounted on the upper
25 cradle assembly 102 by side support members 82, 84. According to
26 this arrangement, the inking/coating apparatus 10 can apply
27 printing ink and/or coating material to a plate on the plate
28 cylinder, while simultaneously applying printing ink and/or
29 coating material to a plate or a blanket on the blanket cylinder
30 of the same printing unit. When the same color ink is used by the
31 upper and lower applicator rollers from the plate position and
32 from the blanket position simultaneously on the same printing
33 unit, a "double bump" or double inking films or coating layers are
34 applied to the substrate S during a single pass of the substrate
35 through the printing unit. The tack of the two inks or coating

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1 materials must be compatible for good transfer during the double
2 bump. Moreover, the inking/coating apparatus 10 can be used for
3 supplying ink or coating material to the blanket cylinder of a
4 rotary offset web press, or to the blanket of a dedicated coating
5 unit.

6 According to conventional bronzing techniques, a
7 metallic (bronze) powder is applied off-line to previously printed
8 substrate which produces a grainy, textured finish or appearance.
9 The on-line application of bronze material by conventional flexo-
10 graphic or lithographic printing will only produce a smooth,
11 continuous appearance. However, a grainy, textured finish is
12 preferred for highest quality printing which, prior to the present
13 invention, could only be produced by off-line methods.

14 Referring now to FIGURE 14 and FIGURE 15, metallic ink
15 or coating material is applied on-line to the substrate S by
16 simultaneous operation of the upper and lower applicator rollers
17 67R, 66 to produce an uneven surface finish having a bronze-like
18 textured or grainy appearance. According to the simulated
19 bronzing method of the present invention, the flexographic bronze
20 ink is applied simultaneously to the plate and to the blanket by
21 the dual cradle inking/coating apparatus 10 as shown in FIGURE 14.
22 A resilient applicator roller 67R is mounted in the upper cradle
23 102, and an anilox applicator roller 66 is mounted on the lower
24 cradle 100. The rollers are supplied from separate doctor blade
25 reservoirs 70. The doctor blade reservoir 70 in the upper cradle
26 position supplies bronze ink or coating material having relatively
27 coarse, metallic particles 140 dispersed in aqueous or flexo-
28 graphic ink. The coarse particle ink or coating material is
29 applied to the plate P by the resilient applicator roller 67R in
30 the upper cradle position 102. At the same time, flexographic
31 and/or bronze ink or coating material having relatively fine,
32 metallic particles 142 is transferred to the blanket B by the
33 anilox roller 66 which is mounted on the lower cradle 100.

34 The metering surfaces of the upper and lower applicator
35 rollers have different cell sizes and volumetric capacities which

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1 accommodate the coarse and fine metallic particles. For example,
2 the anilox roller 111 mounted in the upper cradle position 102
3 which transfers the coarse metallic particles 140 preferably has
4 a screen line count in the range of 100-300 lines per inch (39-118
5 lines per cm), and the metering surface of the anilox roller 66
6 mounted on the lower cradle 100 which transfers the relatively
7 fine metallic particles 142 preferably has a screen line count in
8 the range of 200-600 lines per inch (79-236 lines per cm).

9 After transfer from the plate to the blanket, the fine
10 metallic particles 142 form a layer over the coarse metallic
11 particles 140. As both bronze layers are offset onto the
12 substrate S, the layer of fine metallic particles 142 is printed
13 onto the substrate S with the top layer of coarse metallic
14 particles 140 providing a textured, grainy appearance. The fine
15 metallic particles 142 cover the substrate which would otherwise
16 be visible in the gaps between the coarse metallic particles 140.
17 The combination of the coarse particle layer over the fine
18 particle layer thus provides a textured, bronzed-like finish and
19 appearance.

20 Particulate materials other than metal can be used for
21 producing a textured finish. For example, coarse and fine
22 particles of metallized plastic (glitter), mica particles
23 (pearlescent) and the like, can be substituted for the metallic
24 particles for producing unlimited surface variations, appearances
25 and effects. All of the particulate material, including the
26 metallic particles, are preferably in solid, flat platelet form,
27 and have a size dimension suitable for application by an anilox
28 applicator roller. Other particulate or granular material, for
29 example stone grit having irregular form and size, can be used to
30 good advantage.

31 Solid metal particles in platelet form, which are good
32 reflectors of light, are preferred for producing the bronzed-like
33 appearance and effect. However, various textured finishes, which
34 could have light-reflective properties, can be produced by using
35 granular materials such as stone grit. Most commonly used metals

1 include copper, zinc and aluminum. Other ductile metals can be
2 used, if desired. Moreover, the coarse and fine particles need
3 not be made of the same particulate material. Various effects and
4 textured appearances can be produced by utilizing diverse
5 particulate materials for the coarse particles and the fine
6 particles, respectively. Further, either fine or coarse particle
7 ink or coating material can be printed from the upper cradle
8 position, and either fine or coarse particle ink or coating
9 material can be printed from the lower cradle position, depending
10 on the special or surface finish that is desired.

11 It will be appreciated that the last printing unit 28
12 can be configured for additional inking/coating capabilities which
13 include lithographic, waterless, aqueous and flexographic
14 processes. Various substrate surface effects (for example double
15 bump or triple bump inking/coating or bronzing) can be performed
16 on the last printing unit. For triple bump inking/coating, the
17 last printing unit 28 is equipped with an auxiliary in-line inking
18 or coating apparatus 97 as shown in FIGURE 3 and FIGURE 4. The
19 in-line inking or coating apparatus 97 allows the application of
20 yet another film of ink or a protective or decorative layer of
21 coating material over any freshly printed or coated surface
22 effects or special treatments, thereby producing a triple bump.
23 The triple bump is achieved by applying a third film of ink or
24 layer of coating material over the freshly printed or coated
25 double bump simultaneously while the substrate is on the impres-
26 sion cylinder of the last printing unit.

27 When the in-line inking/coating apparatus 97 is
28 installed, it is necessary to remove the SUPER BLUE® flexible
29 covering from the delivery cylinder 42, and it is also necessary
30 to modify or convert the delivery cylinder 42 for inking/coating
31 service by mounting a plate or blanket B on the delivery cylinder
32 42, as shown in FIGURE 3 and FIGURE 4. Packing material is placed
33 under the plate or blanket B, thereby packing the plate or blanket
34 B at the correct packed-to-print radial clearance so that ink or
35 coating material will be printed or coated onto the freshly

1 printed substrate S as it transfers through the nip between the
2 plate or blanket B on the converted delivery cylinder 42 and the
3 last impression cylinder 36. According to this arrangement, a
4 freshly printed or coated substrate is overprinted or overcoated
5 with a third film or layer of ink or coating material simulta-
6 neously while a second film or layer of ink or coating material is
7 being over-printed or over-coated on the last impression cylinder
8 36.

9 The auxiliary inking/coating apparatus 97 and the
10 converted or modified delivery cylinder 42 are mounted on the
11 delivery drive shaft 43. The inking/coating apparatus 97 includes
12 an applicator roller, preferably an anilox applicator roller 97A,
13 for supplying ink or coating material to a plate or blanket B on
14 the modified or converted delivery cylinder 42. The in-line
15 inking/coating apparatus 97 and the modified or converted delivery
16 cylinder 42 are preferably constructed as described in U.S. Patent
17 5,176,077 to Howard W. DeMoore (co-inventor and assignee), which
18 is hereby incorporated by reference. The in-line inking/coating
19 apparatus 97 is manufactured and sold by Printing Research, Inc.
20 of Dallas, Texas, U.S.A., under its trademark SUPER BLUE EZ
21 COATER™.

22 After the delivery cylinder 42 has been modified or
23 converted for inking/coating service, and because of the reduced
24 nip clearance imposed by the plate or blanket B, the modified
25 delivery cylinder 42 can no longer perform its original function
26 of guiding and transferring the freshly printed or coated
27 substrate. Instead, the modified or converted delivery cylinder
28 42 functions as a part of the inking/coating apparatus 97 by
29 printing or coating a third down film of ink or layer of coating
30 material onto the freshly printed or coated substrate as it is
31 simultaneously printed or coated on the last impression cylinder
32 36. Moreover, the mutual tack between the second down ink film or
33 coating layer and the third down ink film or coating layer causes
34 the overprinted or overcoated substrate to cling to the plate or

1 blanket, thus opposing or resisting separation of the substrate
2 from the plate or blanket.

3 To remedy this problem, a vacuum-assisted transfer
4 apparatus 99 is mounted adjacent the modified or converted
5 delivery cylinder 42 as shown in FIGURE 3 and FIGURE 4. Another
6 purpose of the vacuum-assisted transfer apparatus 99 is to
7 separate the freshly overprinted or overcoated triple bump
8 substrate from the plate or blanket B as the substrate transfers
9 through the nip. The vacuum-assisted transfer apparatus 99
10 produces a pressure differential across the freshly overprinted or
11 overcoated substrate as it transfers through the nip, thus
12 producing a separation force onto the substrate and providing a
13 clean separation from the plate or blanket B.

14 The vacuum-assisted transfer apparatus 99 is preferably
15 constructed as described in U.S. Patent Nos. 5,113,255; 5,127,329;
16 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W.
17 DeMoore, co-inventor, which are incorporated herein by reference.
18 The vacuum-assisted transfer apparatus 99 is manufactured and sold
19 by Printing Research, Inc. of Dallas, Texas, U.S.A. under its
20 trademark BACVAC™.

21 Although the present invention and its advantages have
22 been described in detail, it should be understood that various
23 changes, substitutions and alterations can be made herein without
24 departing from the spirit and scope of the present invention as
25 defined by the appended claims.

What is claimed is:

1 1. A method for printing in a rotary offset press of
2 the type including first and second printing units, the first
3 printing unit having a flexographic printing plate, a blanket, an
4 impression cylinder and inking/coating applicator means for
5 applying aqueous or flexographic printing ink or coating material
6 to the flexographic printing plate and/or to the blanket,
7 comprising the following steps performed in succession in the
8 first printing unit:

9 applying a first spot or overall coating of aqueous
10 or flexographic printing ink or coating material to the flexo-
11 graphic printing plate;

12 transferring the aqueous or flexographic printing
13 ink or coating material from the flexographic printing plate to
14 the blanket;

15 applying a second spot or overall film of aqueous
16 or flexographic printing ink or layer of coating material to the
17 blanket;

18 transferring ink or coating material from the
19 blanket to a substrate as the substrate is transferred through the
20 nip between the blanket and the impression cylinder; and,

21 drying the aqueous or flexographic ink or coating
22 material on the freshly printed or coated substrate before the
23 substrate is printed, coated or otherwise processed on the second
24 printing unit.

1 2. The printing method as defined in claim 1,
2 including the steps:

3 applying a primer coating of an aqueous or
4 flexographic ink or coating material to a substrate in the first
5 printing unit;

6 trapping and sealing particulate material such as
7 dust, lint, anti-offset spray powder and the like under the primer
8 coating;

9 drying the primer coating on the substrate before
10 the substrate is printed or coated on the second printing unit;
11 and,
12 overprinting the freshly coated substrate in the
13 second printing unit.

1 3. The printing method as defined in claim 1,
2 wherein the drying step is performed by directing
3 heated air onto the freshly printed or coated substrate while the
4 freshly printed or coated substrate is in contact with the
5 impression cylinder of the first printing unit.

1 4. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an intermediate transfer cylinder disposed between
5 the first and second printing units; and,
6 drying the freshly printed or coated substrate
7 while said substrate is in contact with the intermediate transfer
8 cylinder.

1 5. The printing method as defined in claim 1, wherein:
2 the drying step is performed by directing heated
3 air onto the freshly printed or coated substrate while the freshly
4 printed or coated substrate is in contact with an impression
5 cylinder in the second printing unit.

1 6. The printing method as defined in claim 1, wherein
2 the drying step is performed by directing heated air from a dryer
3 onto the freshly printed or coated substrate, and including the
4 step:
5 extracting hot air, moisture and volatiles from an
6 exposure zone between the freshly printed or coated substrate and
7 the dryer while the freshly printed or coated substrate is in
8 contact with the impression cylinder of the first printing unit.

1 7. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an intermediate transfer cylinder disposed between
5 the first and second printing units;
6 directing heated air from a dryer onto the freshly
7 printed or coated substrate while said substrate is in contact
8 with the intermediate transfer cylinder; and,
9 extracting hot air, moisture and volatiles from an
10 exposure zone between the freshly printed or coated substrate and
11 said dryer while the freshly printed or coated substrate is in
12 contact with the intermediate transfer cylinder.

1 8. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an impression cylinder on the second printing unit;
5 directing heated air from a dryer onto the freshly
6 printed or coated substrate while said substrate is in contact
7 with the impression cylinder of the second printing unit; and,
8 extracting hot air, moisture and volatiles from an
9 exposure zone between the freshly printed or coated substrate and
10 said dryer while said substrate is in contact with the impression
11 cylinder of the second printing unit.

1 9. A method for providing an uneven printed or coated
2 layer on a substrate in a rotary offset printing press of the type
3 including a printing unit having a plate cylinder, a flexographic
4 printing plate mounted on the plate cylinder, a blanket cylinder,
5 a plate or blanket mounted on the blanket cylinder, an impression
6 cylinder and applicator means for applying aqueous or flexographic
7 printing ink or coating material to the flexographic printing
8 plate and/or to the plate or blanket on the blanket cylinder,
9 comprising the following steps performed in succession in the
10 printing unit:

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11 applying a first down layer of aqueous or flexo-
12 graphic ink or coating material containing relatively coarse
13 particles to the flexographic plate;

14 transferring the relatively coarse particle
15 printing ink or coating material from the flexographic printing
16 plate to the plate or blanket on the blanket cylinder;

17 applying a second down layer of aqueous or
18 flexographic printing ink or coating material containing relative-
19 ly fine particles onto the relatively coarse particle printing ink
20 or coating material;

21 transferring the coarse and fine particle ink or
22 coating material from the blanket or plate on the blanket cylinder
23 onto a substrate as the substrate is transferred through the nip
24 between the blanket cylinder and the impression cylinder; and,

25 drying the freshly printed or coated substrate
26 before the freshly printed or coated substrate is subsequently
27 printed, coated or otherwise processed.

1 10. The method as set forth in claim 9, wherein the
2 coarse and fine particles comprise a metal selected from the group
3 including copper, zinc and aluminum.

1 11. The method as set forth in claim 9, wherein the
2 coarse and fine particles comprise a non-metallic material
3 selected from the group consisting of mica, silicon, stone grit
4 and plastic.

1 12. The method as set forth in claim 9, wherein the
2 coarse and fine particles comprise diverse particulate materials,
3 respectively.

1 13. A method for printing or coating a substrate on the
2 last printing unit of a rotary offset printing press of the type
3 including a plate cylinder, a printing plate mounted on the plate
4 cylinder, a blanket cylinder, a plate or blanket mounted on the

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5 blanket cylinder, an impression cylinder, inking/coating apparatus
6 for applying printing ink or coating material simultaneously or
7 separately to the flexographic printing plate and/or to the plate
8 or blanket on the blanket cylinder, and including an ink-
9 ing/coating cylinder mounted adjacent the last printing unit for
10 printing a film of ink or layer of coating material over a freshly
11 printed substrate, comprising the steps:

12 applying a first down film of printing ink or layer
13 of coating material to the printing plate;

14 transferring printing ink or coating material from
15 the printing plate to a plate or blanket on the blanket cylinder;

16 applying a second down film of printing ink or
17 layer of coating material over the first down film or layer on the
18 plate or blanket on the blanket cylinder;

19 transferring ink or coating material from the
20 blanket or plate on the blanket cylinder onto a substrate as the
21 substrate is transferred through the nip between the blanket
22 cylinder and the impression cylinder; and

23 simultaneously printing a third down film of
24 printing ink or layer of coating material over the second down
25 film of ink or layer of coating material while the second down
26 film or layer is being printed or coated on the last impression
27 cylinder.

1 14. A method for printing or coating a substrate in a
2 rotary offset printing press of the type including a printing unit
3 having a plate cylinder, a flexographic printing plate mounted on
4 the plate cylinder, a blanket cylinder, a plate or blanket mounted
5 on the blanket cylinder, an impression cylinder, and ink-
6 ing/coating apparatus for applying flexographic or aqueous
7 printing ink or coating material to the flexographic printing
8 plate and/or to the plate or blanket on the blanket cylinder,
9 comprising the following steps:

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10 applying a first down film or layer of flexographic
11 or aqueous printing ink or coating material to the flexographic
12 printing plate;

13 transferring printing ink or coating material from
14 the flexographic printing plate to the plate or blanket on the
15 blanket cylinder;

16 applying a second down film or layer of aqueous or
17 flexographic printing ink or coating material over the first down
18 film or layer on the plate or blanket on the blanket cylinder;

19 transferring ink or coating material from the
20 blanket or plate on the blanket cylinder onto a substrate as the
21 substrate is transferred through the nip between the blanket
22 cylinder and the impression cylinder; and,

23 drying the freshly printed or coated substrate
24 before the substrate is subsequently printed, coated or otherwise
25 processed.

1 15. A method of printing or coating a substrate in a
2 rotary offset printing press as set forth in claim 14, wherein the
3 printing unit is the last printing unit of the rotary offset
4 printing press and a delivery cylinder is mounted on the last
5 printing unit for transferring the freshly printed substrate along
6 a substrate travel path, including the steps:

7 modifying the delivery cylinder by mounting a plate
8 or blanket on the delivery cylinder;

9 transferring ink or coating material to the plate
10 or blanket on the modified delivery cylinder; and

11 transferring a third down film or layer of aqueous
12 or flexographic printing ink or coating material from the plate or
13 blanket over the second down film or layer simultaneously while
14 the freshly printed or coated substrate is on the last impression
15 cylinder of the last printing unit.

1 16. A method for rotary offset printing as defined in
2 any one of claims 1, 9, 13 or 14, including the steps:

3 circulating liquid ink or coating material from a
4 supply container to said inking/coating applicator means and from
5 said inking/coating applicator means to the supply container; and,
6 heating or cooling the liquid ink or coating
7 material as it is circulated.

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"RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE
AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER
SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE
PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS"

Abstract of the Disclosure

1 A retractable in-line inking/coating apparatus can apply
2 either spot or overall inking/coating material to a plate and/or
3 a blanket on the first printing unit or on any consecutive
4 printing unit of any rotary offset printing press. The ink-
5 ing/coating apparatus is pivotally mounted within the conventional
6 dampener space of any lithographic printing unit. The aqueous
7 component of the flexographic printing ink or aqueous coating
8 material is evaporated and dried by high velocity, hot air dryers
9 and high performance heat and moisture extractors so that the
10 aqueous or flexographic ink or coating material on a freshly
11 printed or coated sheet is dry and can be dry-trapped on the next
12 printing unit. The inking/coating apparatus includes dual cradles
13 that support first and second applicator rollers so that the ink-
14 ing/coating apparatus can apply a double bump of aque-
15 ous/flexographic or UV-curable printing ink or coating material to
16 a plate on the plate cylinder, while simultaneously applying
17 aqueous, flexographic or UV-curable printing ink or coating
18 material to a plate or a blanket on the blanket cylinder, and
19 thereafter onto a sheet as the sheet is transferred through the
20 nip between the blanket cylinder and the impression cylinder. A
21 triple bump is printed or coated on the last printing unit with
22 the aid of an impression cylinder inking/coating unit.

* * * * *

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Attorney Docket No.

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SMALL ENTITY
INDEPENDENT INVENTOR

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECLARATION CLAIMING SMALL ENTITY STATUS
(37 C.F.R. §1.9(f) and §1.27 (b)) - INDEPENDENT INVENTOR

I, HOWARD W. DEMOORE, hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. §1.9(c) for the purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the U.S. Patent and Trademark Office with regard to the invention entitled

"RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS",

X in the application filed herewith.

_____ in U.S. application Serial No. _____ filed _____.

_____ patent No. _____, issued _____.

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. §1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. §1.9(d) or a non-profit organization under 37 C.F.R. §1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under any obligation under contract or law to assign, grant, convey, or license any rights in the invention is identified below:

_____ no such person, concern or organization exists.

☒ any such person, concern or organization is identified below, if applicable:

Full Name Printing Research, Inc.

Address 10954 Shady Trail

Dallas, Texas 75220

☐ individual ☒ small business concern
☐ nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate pursuant to 37 C.F.R. §1.28(b).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Printed Name of Inventor: Howard W. DeMotte

Date: 9/11/95

Howard W. DeMotte
Signature of Inventor

DTG:119760181700CS:86038 053

Attorney Docket No.

B6038B

SMALL ENTITY
INDEPENDENT INVENTOR

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECLARATION CLAIMING SMALL ENTITY STATUS
(37 C.F.R. §1.9(f) and §1.27 (b)) - INDEPENDENT INVENTOR

I, RONALD M. RENDLEMAN, hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. §1.9(c) for the purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the U.S. Patent and Trademark Office with regard to the invention entitled

"RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS",

X in the application filed herewith.

_____ in U.S. application Serial No. _____ filed

_____ patent No. _____, issued _____.

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. §1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. §1.9(d) or a non-profit organization under 37 C.F.R. §1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under any obligation under contract or law to assign, grant, convey, or license any rights in the invention is identified below:

_____ no such person, concern or organization exists.

09315716-054101

☒ any such person, concern or organization is identified below, if applicable:

Full Name Howard W. DeMoore

Address 10954 Shady Trail

Dallas, Texas 75220

☒ individual ☐ small business concern
☐ nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate pursuant to 37 C.F.R. §1.28(b).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Printed Name of Inventor: Ronald M. Rendleman

Date: 9-11-95


Signature of Inventor

Attorney Docket No.

B6038B

SMALL ENTITY
INDEPENDENT INVENTOR

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECLARATION CLAIMING SMALL ENTITY STATUS
(37 C.F.R. §1.9(f) and §1.27 (b)) - INDEPENDENT INVENTOR

I, JOHN W. BIRD, hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. §1.9(c) for the purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the U.S. Patent and Trademark Office with regard to the invention entitled

"RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS",

X in the application filed herewith.

_____ in U.S. application Serial No. _____ filed _____.

_____ patent No. _____, issued _____.

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. §1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. §1.9(d) or a non-profit organization under 37 C.F.R. §1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under any obligation under contract or law to assign, grant, convey, or license any rights in the invention is identified below:

_____ no such person, concern or organization exists.

X any such person, place, or organization is identified below, if applicable:

Full Name Howard W. DeMoore

Address 10954 Hwy Trail

Dal res 75220

X Dal small business concern

nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate pursuant to 37 C.F.R. §1.28(b).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Printed Name of Inventor: John W. Bird

Date: 9.11.95

John W. Bird
Signature of Inventor

DTG1 1750181DOC586-38 SE2

PATENT
JOINT
UTILITY

Attorney Docket
No. B6038B

DECLARATION AND POWER OF ATTORNEY

We, HOWARD W. DEMOORE, RONALD M. RENDLEMAN and JOHN W. BIRD, joint inventors herein, hereby declare that:

Our residence, post office address and citizenship are as stated below next to our names.

We believe that we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled

"RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS",

the specification of which is attached hereto.

We hereby state that we have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to in this declaration.

We each individually acknowledge the duty to disclose to the U.S. Patent Office all information known to me that is material to the patentability of any claim in accordance with Title 37, Code of Federal Regulations, §1.56, and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent.

We hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

| <u>Country</u> | <u>Application No.</u> | <u>Filing Date</u> <u>(day, month, year)</u> |
|----------------|------------------------|---|
|----------------|------------------------|---|

- NONE -

We hereby claim the benefit under Title 35, United States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, we acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

| <u>U.S. Serial No.</u> | <u>U.S. Filing Date</u> | <u>Status</u> |
|------------------------|-------------------------|---------------|
| 08/435,798 | May 4, 1995 | Pending |

① We hereby appoint DENNIS T. GRIGGS, Registration No. 27,790, of the firm of AKIN, GUMP, STRAUSS, HAUER & FELD, L.L.P., our attorney to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith. We request that all correspondence be addressed to:

Dennis T. Griggs
Akin, Gump, Strauss, Hauer & Feld, L.L.P.
1700 Pacific Avenue, Suite 4100
Dallas, Texas 75201-4618

Phone: 214/969-2747

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

1-00
Full name of
first joint Inventor: Howard W. DeMoore
Residence: Dallas, Texas TX
Citizenship: U.S.
Post Office Address: 10954 Shady Trail
Dallas, Texas 75220

Date: 9/11/95 Howard W. DeMoore
Howard W. DeMoore

2.00

Full name of
second joint Inventor: Ronald M. Rendleman

Residence: Dallas, Texas TX

Citizenship: U.S.

Post Office Address: 4331 Royal Ridge
Dallas, Texas 75229

Date: 9.11.95

Ronald M. Rendleman

3.00

Full name of
third joint Inventor: John W. Bird

Residence: Carrollton, Texas TX

Citizenship: United Kingdom

Post Office Address: 1514 Iroquois Circle
Carrollton, Texas 75007

Date: 9.11.95

John W. Bird



Attorney Docket No.

B6038B

SMALL ENTITY
SMALL BUSINESS CONCERN

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL
ENTITY STATUS (37 C.F.R. §1.9(f) and §1.27(c))--
SMALL BUSINESS CONCERN

I, HOWARD W. DEMOORE

hereby declare that I am

 the owner of the small business concern identified below:

 X an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN Printing Research, Inc.
ADDRESS OF CONCERN 10954 Shady Trail
Dallas, Texas 75220

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 C.F.R. §121.3-18, and reproduced in 37 C.F.R. §1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when, either directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under license, contract or law have been acquired by or conveyed to and remain with the small business concern identified above with regard to the invention entitled

"RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE
PLATE AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE
DAMPENER SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECU-
TIVE PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS",

by inventors Howard W. DeMoore, Ronald M. Rendleman and John W.
Bird

as described in

- ☒ the specification filed herewith.
☐ the specification filed _____ under Serial
No. _____
☐ Patent No. _____, issued _____

If the rights held by the above-identified small business
concern are not exclusive, each individual, concern or organiza-
tion having rights to the invention is listed below and no rights
to the invention are held by any person, other than the inventor,
who could not qualify as a small business concern under 37 C.F.R.
§1.9(d) or by any concern which would not qualify as a small
business concern under 37 C.F.R. §1.9(d) or a nonprofit organiza-
tion under 37 C.F.R. §1.9(e).

- ☒ no such person, concern or organization exists
☐ any such person, concern or organization is iden-
tified below, if applicable:

Full Name _____

Address _____

- ☐ individual ☐ small business concern
☐ nonprofit organization

I acknowledge the duty to file, in this application or
patent, notification of any change in status resulting in loss
of entitlement to small entity status prior to paying, or at the
time of paying, the earliest of the issue fee or any maintenance
fee due after the date on which status as a small business entity
is no longer appropriate. (37 C.F.R. §1.28(b)).

I hereby declare that all statements made herein of my own
knowledge are true and that all statements made on information
and belief are believed to be true; and further that these

statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

TYPED NAME OF PERSON SIGNING Howard W. DeMoore

TITLE OF PERSON OTHER THAN OWNER President and Chairman of
the Board

Date:

9/11/95

Signature

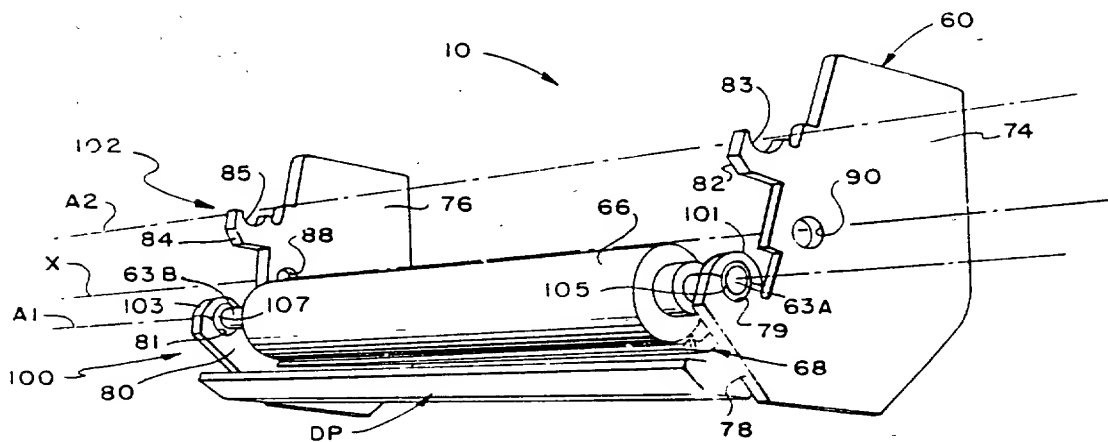
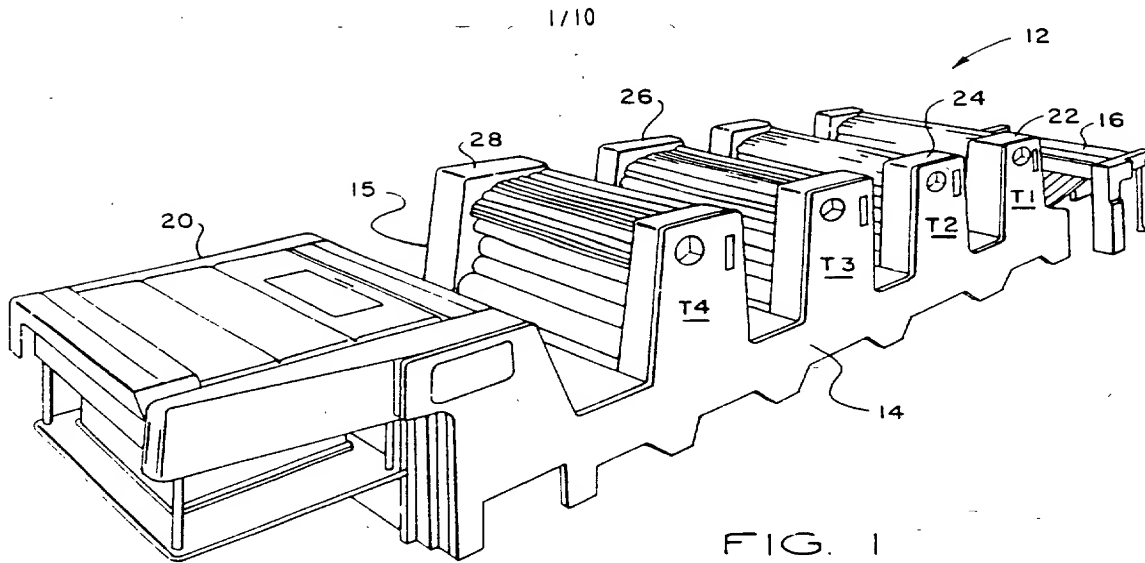
Howard W. DeMoore

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HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

538123



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HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

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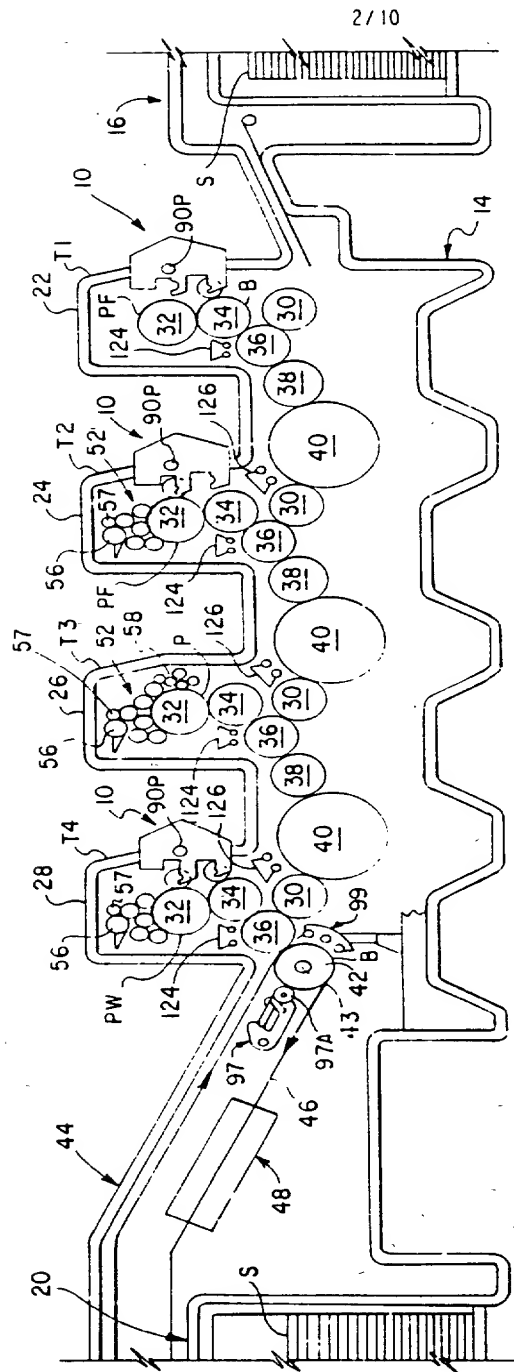
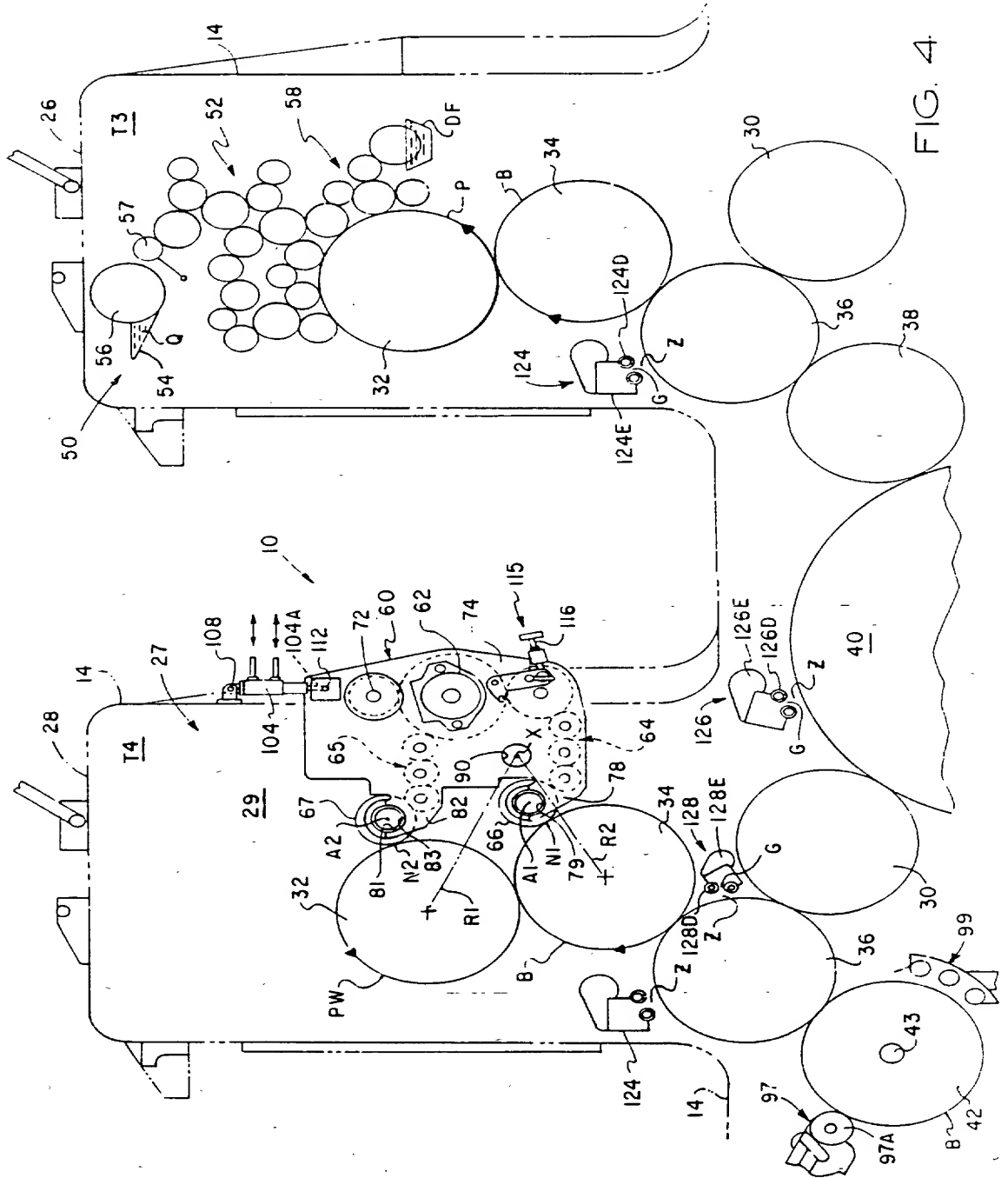


FIG. 3

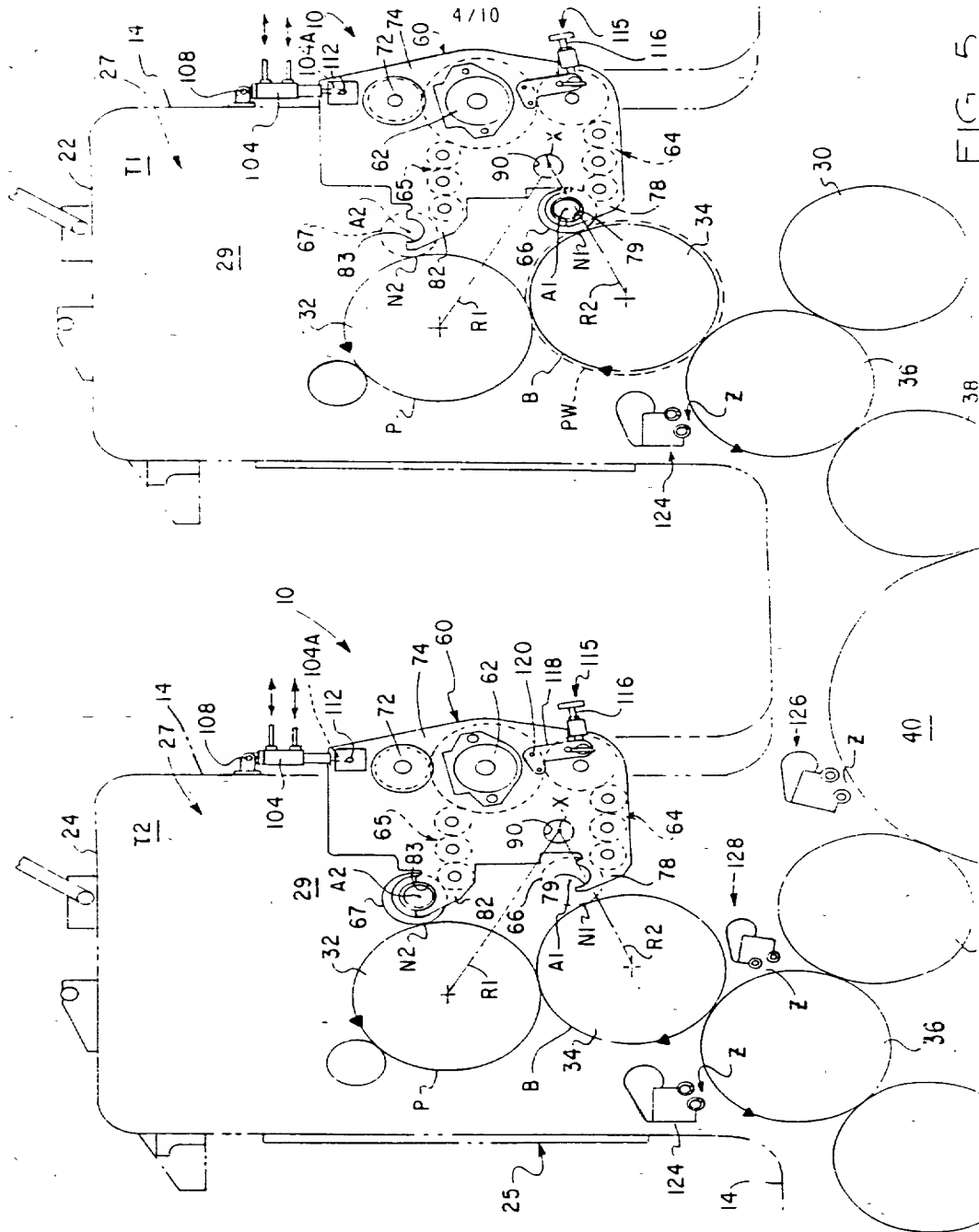
HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

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FIG. 7

[illegible]

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HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

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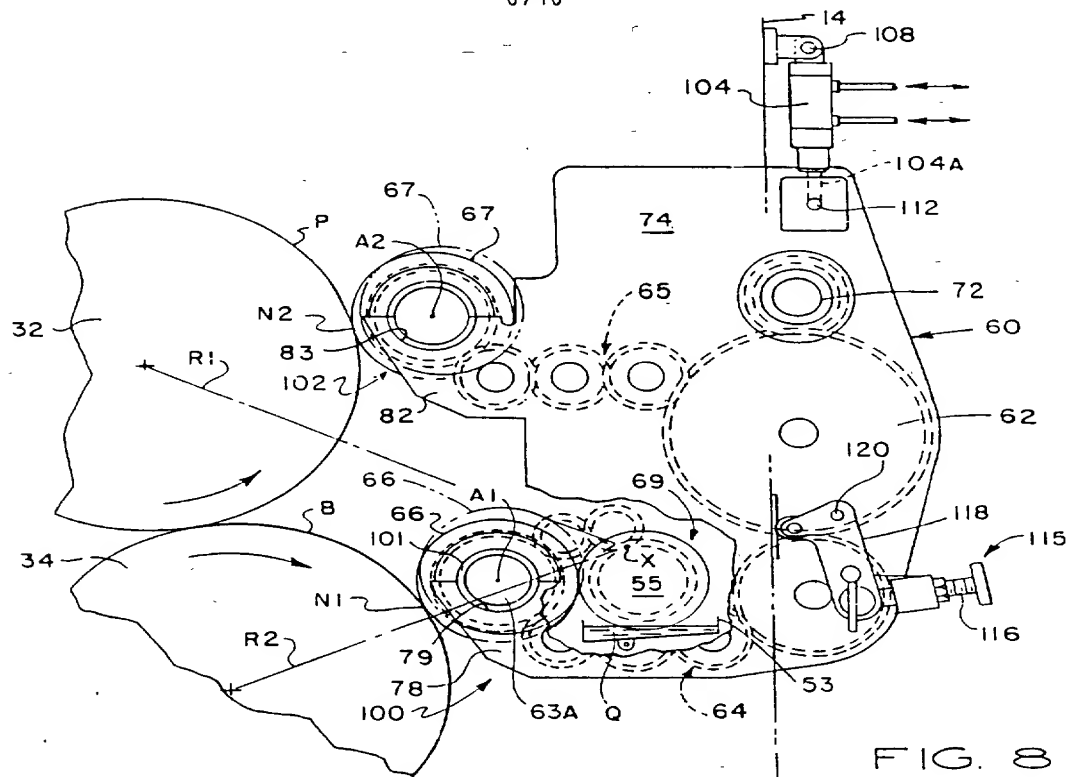


FIG. 8

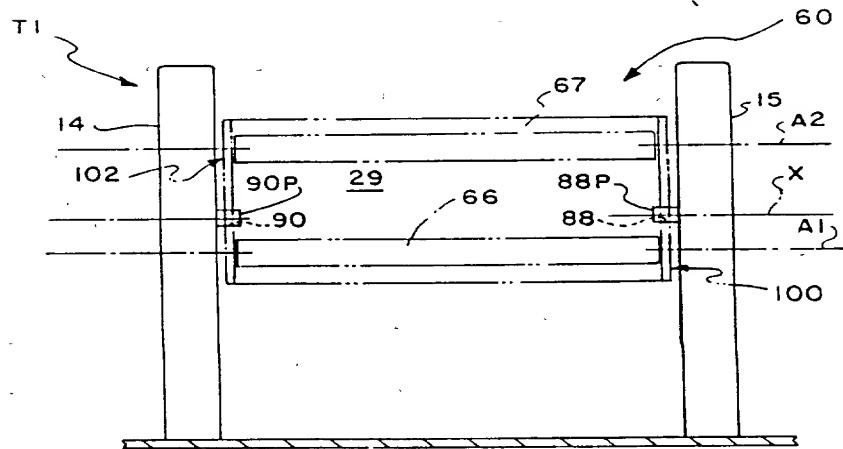


FIG. 9

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HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

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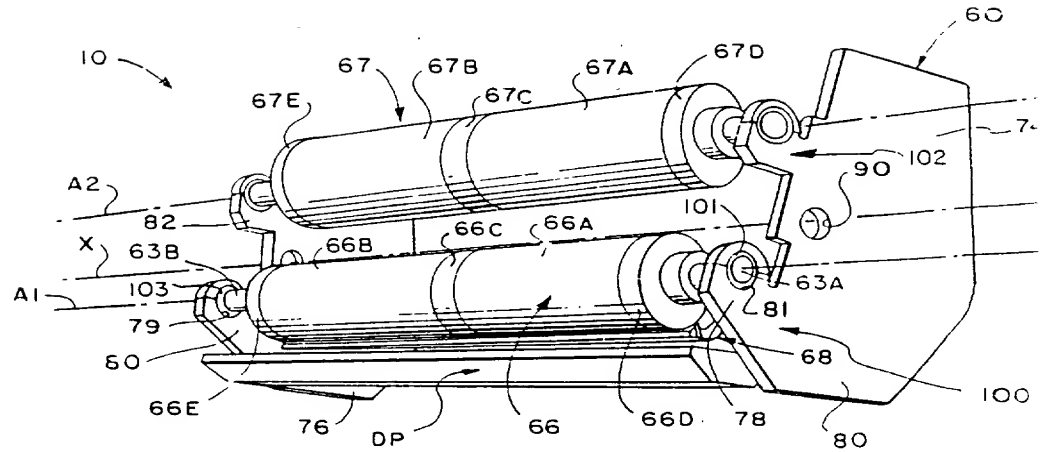


FIG. 10

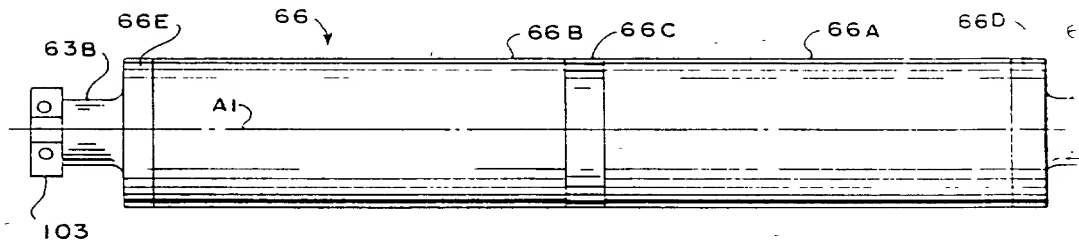


FIG. 11

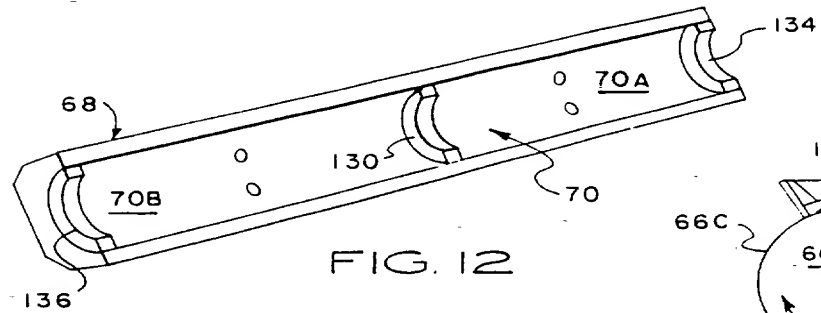


FIG. 12

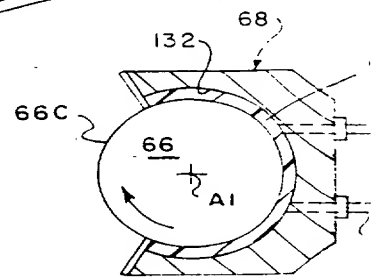


FIG. 13

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HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

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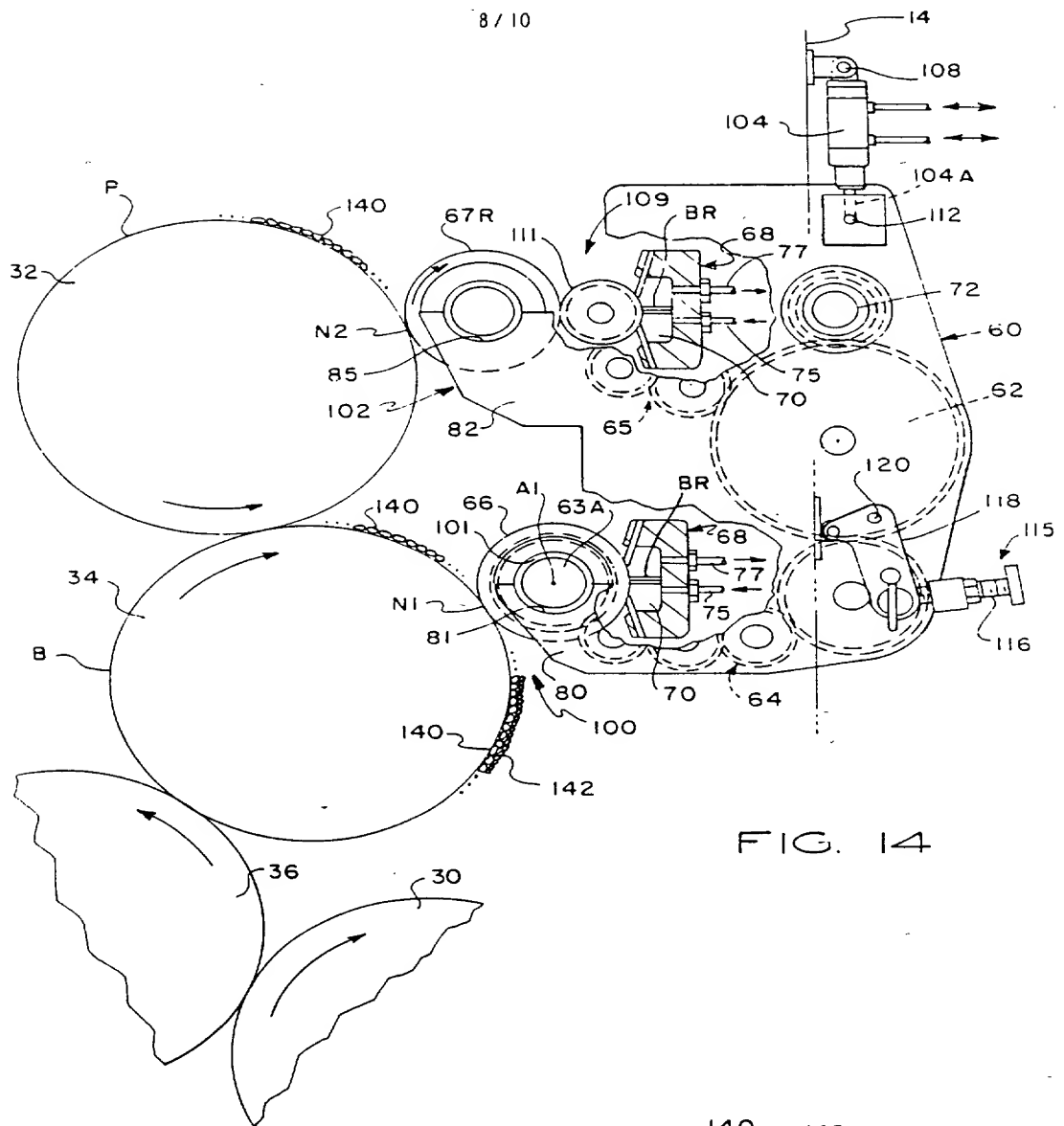


FIG. 14



FIG. 15

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HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

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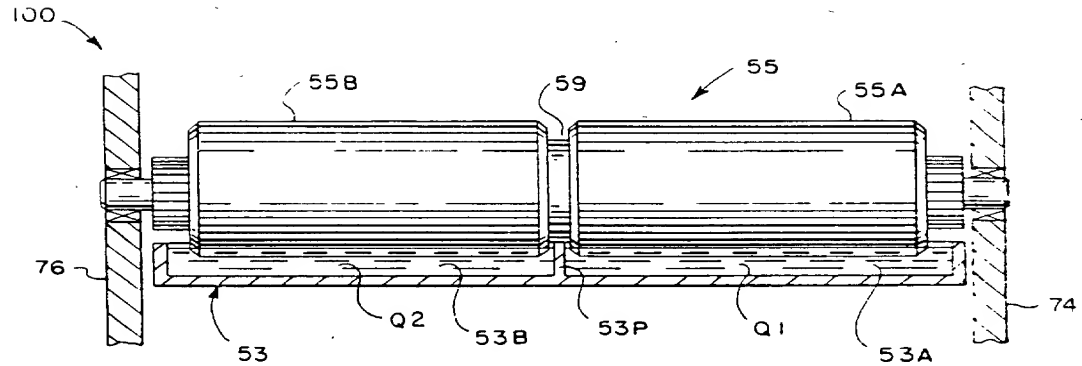


FIG. 16

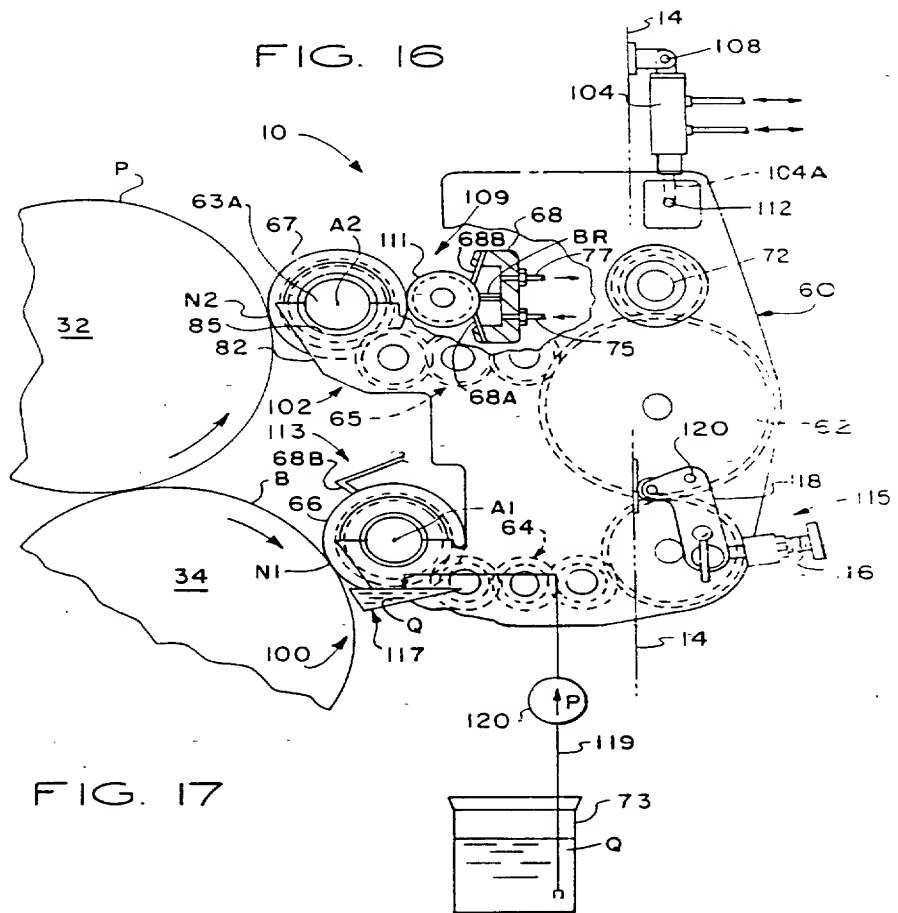


FIG. 17

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RONALD M. RENDLEMAN
JOHN W. BIRD

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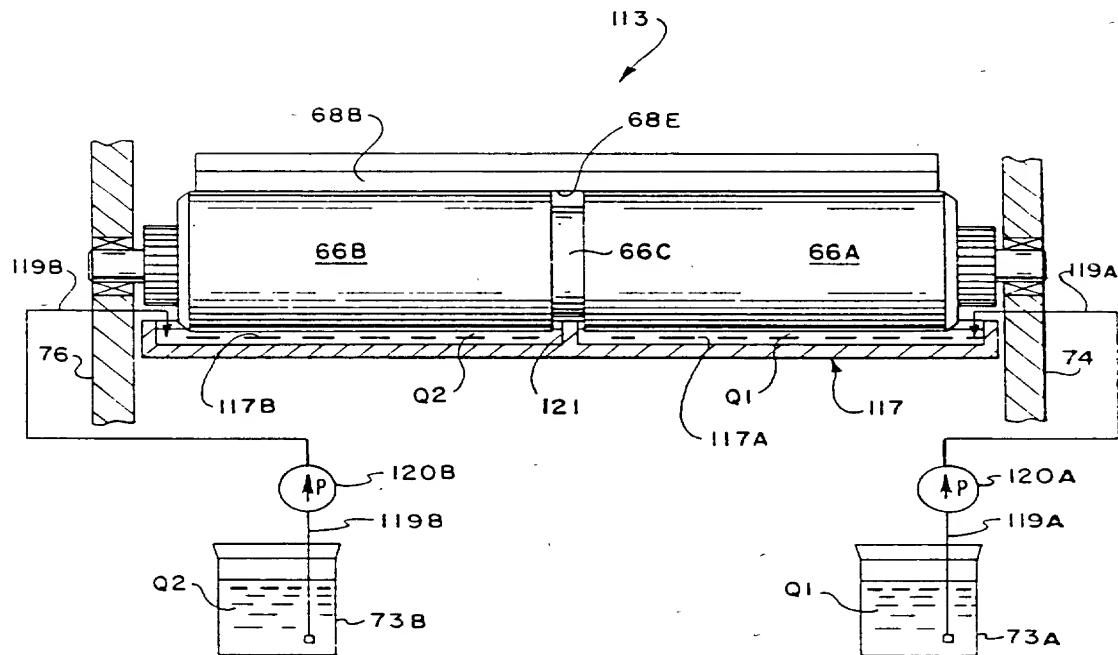


FIG. 18

UEXKÜLL & STOLBERG
PATENTANWÄLTE

BESELERSTRASSE 4
D - 22607 HAMBURG

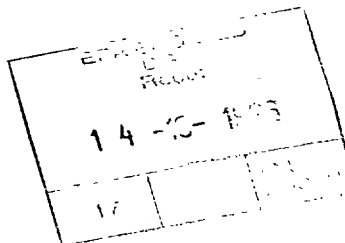
EUROPEAN PATENT ATTORNEYS

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DR. ALLARD von KAMEKE
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DR. ULRICH-MARIA GROSS
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TELEFON: (040) 899 6540
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100763.733@COMPUSERVE.COM
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European Patent Office
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80331 München

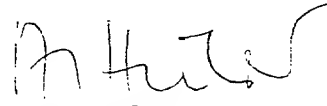


Application No.: 96250219.1
Applicant : DeMoore, Howard W. ✓

Please find the following documents enclosed:

- 3 copies of the specification, claims, abstract and drawings in EPO format.

Further, please note that applicant's family name is DeMoore, the given names being Howard W.


A. Huber
(Association No. 1)

DATUMTES 7x
Searchfile 7x
Planfile 1x

W BORINSKI

05. 11. 96

0934796 Oct 11 1969

Field of the Invention

1 This invention relates generally to sheet-fed or web-
2 fed, rotary offset lithographic printing presses, and more
3 particularly, to a new and improved inking/coating apparatus for
4 the in-line application of aqueous or flexographic printing inks,
5 primer or protective/decorative coatings applied simultaneously to
6 the plate and blanket of the first or any consecutive printing
7 unit of any lithographic printing press.

Background of the Invention

8 Conventional sheet-fed, rotary offset printing presses
9 typically include one or more printing units through which
10 individual sheets are fed and printed. After the last printing
11 unit, freshly printed sheets are transferred by a delivery
12 conveyor to the delivery end of the press where the freshly
13 printed and/or coated sheets are collected and stacked uniformly.
14 In a typical sheet-fed, rotary offset printing press such as the
15 Heidelberg Speedmaster line of presses, the delivery conveyor
16 includes a pair of endless chains carrying gripper bars with
17

1 gripper fingers which grip and pull freshly printed sheets from
2 the last impression cylinder and convey the sheets to the sheet
3 delivery stacker.

4 . Since the inks used with sheet fed rotary offset
5 printing presses are typically wet and tacky, special precautions
6 must be taken to prevent marking and smearing of the freshly
7 printed or coated sheets as the sheets are transferred from one
8 printing unit to another. The printed ink on the surface of the
9 sheet dries relatively slowly and is easily smeared during subse-
10 quent transfer between printing units. Marking, smearing and
11 smudging can be prevented by a vacuum assisted sheet transfer
12 apparatus as described in the following U.S. Patents: 5,113,255;
13 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to
14 Howard W. DeMoore, co-inventor, and manufactured and sold by
15 Printing Research, Inc. of Dallas, Texas, U.S.A. under its
16 trademark BACVAC™.

17 In some printing jobs, offsetting is prevented by
18 applying a protective and/or decorative coating material over all
19 or a portion of the freshly printed sheets. Some coatings are
20 formed of a UV-curable or water-dispersed resin applied as a
21 liquid solution over the freshly printed sheets to protect the ink
22 from offsetting or set-off and improve the appearance of the
23 freshly printed sheets. Such coatings are particularly desirable
24 when decorative or protective finishes are applied in the printing
25 of posters, record jackets, brochures, magazines, folding cartons
26 and the like.

27 Description of the Prior Art

28 Various arrangements have been made for applying the
29 coating as an in-line printing operation by using the last
30 printing unit of the press as the coating application unit. For
31 example, U.S. Patents 4,270,483; 4,685,414; and 4,779,557 disclose
32 coating apparatus which can be moved into position to permit the
33 blanket cylinder of the last printing unit of a printing press to
34 be used to apply a coating material over the freshly printed

1 sheets. In U.S. Patent 4,841,903 (Bird) there are disclosed
2 coating apparatus which can be selectively moved between the plate
3 cylinder or the blanket cylinder of the last printing unit of the
4 press so the last printing unit can only be used for coating
5 purposes. However, when coating apparatus of these types are
6 being used, the last printing unit cannot be used to print ink to
7 the sheets, but rather can only be used for the coating operation.
8 Thus, while coating with this type of in-line coating apparatus,
9 the printing press loses the capability of printing on the last
10 printing unit as it is converted to a coating unit.

11 The coater of U.S. Patent 5,107,790 (Sliker et al) is
12 retractable along an inclined rail for extending and retracting a
13 coater head into engagement with a blanket on the blanket
14 cylinder. Because of its size, the rail-retractable coater can
15 only be installed between the last printing unit of the press and
16 the delivery sheet stacker, and cannot be used for interunit
17 coating. The coater of U.S. Patent 4,615,293 (Jahn) provides two
18 separate, independent coaters located on the dampener side of a
19 converted printing unit for applying lacquer to a plate and to a
20 rubber blanket. Consequently, although a plate and blanket are
21 provided, the coating unit of Jahn's press is restricted to a
22 dedicated coating operation only.

23 Proposals have been made for overcoming the loss of a
24 printing unit when in-line coating is used, for example as set
25 forth in U.S. Patent 5,176,077 to Howard W. DeMoore (co-inventor
26 and assignee), which discloses a coating apparatus having an
27 applicator roller positioned to apply the coating material to the
28 freshly printed sheet while the sheet is still on the last
29 impression cylinder of the press. This allows the last printing
30 unit to print and coat simultaneously, so that no loss of printing
31 unit capability results.

32 Some conventional coaters are rail-mounted and occupy a
33 large amount of press space and reduce access to the press.
34 Elaborate equipment is needed for retracting such coaters from the

1 operative coating position to the inoperative position, which
2 reduces access to the printing unit.

3 Accordingly, there is a need for an in-line ink-
4 ing/coating apparatus which does not result in the loss of a
5 printing unit, does not extend the length of the press, and which
6 can print and coat aqueous and flexographic inks and coating
7 materials simultaneously onto the plate and blanket on any litho-
8 graphic printing unit of any lithographic printing press,
9 including the first printing unit.

10 Objects of the Invention

11 Accordingly, a general object of the present invention
12 is to provide improved inking/coating apparatus which is capable
13 of selectively applying ink or coating material to a plate on a
14 plate cylinder or ink or coating material to a plate or blanket on
15 a blanket cylinder.

16 A specific object of the present invention is to provide
17 improved inking/coating apparatus of the character described which
18 is extendable into inking/coating engagement with either a plate
19 on a plate cylinder or to a plate or blanket on a blanket
20 cylinder.

21 A related object of the present invention is to provide
22 improved inking/coating apparatus of the character described which
23 is capable of being mounted on any lithographic printing unit of
24 the press and does not interfere with operator access to the plate
25 cylinder, blanket cylinder, or adjacent printing units.

26 Another object of the present invention is to provide
27 improved inking/coating apparatus of the character described,
28 which can be moved from an operative inking/coating engagement
29 position adjacent to a plate cylinder or a blanket cylinder to a
30 non-operative, retracted position.

31 Still another object of the present invention is to
32 provide improved inking/coating apparatus of the character
33 described, which can be used for applying aqueous, flexographic
34 and ultra-violet curable inks and/or coatings in combination with

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1 lithographic, flexographic and waterless printing processes on any
2 rotary offset printing press.

3 A related object of the present invention is to provide
4 improved inking/coating apparatus of the character described,
5 which is capable of applying aqueous or flexographic ink or
6 coating material on one printing unit, for example the first
7 printing unit, and drying the ink or coating material before it is
8 printed or coated on the next printing unit so that it can be
9 overprinted or overcoated immediately on the next printing unit
10 with waterless, aqueous, flexographic or lithographic inks or
11 coating materials.

12 Yet another object of the present invention is to
13 provide improved inking/coating apparatus for use on a multiple
14 color rotary offset printing press that can apply ink or coating
15 material separately and/or simultaneously to the plate and/or
16 blanket of a printing unit of the press from a single operative
17 position, and from a single inking/coating apparatus.

18 A related object of the present invention is to provide
19 improved inking/coating apparatus of the character described, in
20 which virtually no printing unit adjustment or alteration is
21 required when the inking/coating apparatus is converted from plate
22 to blanket printing or coating and vice versa.

23 Another object of the present invention is to provide
24 improved inking/coating apparatus that can be operably mounted in
25 the dampener space of any lithographic printing unit for ink-
26 ing/coating engagement with either a plate on a plate cylinder or
27 a plate or blanket on a blanket cylinder, and which does not
28 interfere with operator movement or activities in the interunit
29 space between printing units.

30 Summary of the Invention

31 The foregoing objects are achieved by a retractable, in-
32 line inking/coating apparatus which is mounted on the dampener
33 side of any printing unit of a rotary offset press for movement
34 between an operative (on-impression) inking/coating position and

1 a retracted, disengaged (off-impression) position. The ink-
2 ing/coating apparatus includes an applicator roller which is
3 movable into and out of engagement with a plate on a plate
4 cylinder or a blanket on a blanket cylinder. The inking/coating
5 applicator head is pivotally coupled to a printing unit by pivot
6 pins which are mounted on the press side frames in the traditional
7 dampener space of the printing unit in parallel alignment with the
8 plate cylinder and the blanket cylinder. This dampener space
9 mounting arrangement allows the inking/coating unit to be
10 installed between any adjacent printing units on the press.

11 In the preferred embodiment, the applicator head
12 includes vertically spaced pairs of cradle members with one cradle
13 pair being adapted for supporting an inking/coating applicator
14 roller in alignment with a plate cylinder, and the other cradle
15 pair supporting an inking/coating applicator roller in alignment
16 with the blanket cylinder, respectively, when the applicator head
17 is in the operative position. Because of the pivotal support
18 provided by the pivot pins, the applicator head can be extended
19 and retracted within the limited space available in the tradition-
20 al dampener space, without restricting operator access to the
21 printing unit cylinders and without causing a printing unit to
22 lose its printing capability.

23 When the inking/coating apparatus is used in combination
24 with a flexographic printing plate and aqueous or flexographic ink
25 or coating material, the water component of the aqueous or
26 flexographic ink or coating material on the freshly printed or
27 coated sheet is evaporated and dried by a high velocity, hot air
28 interunit dryer and a high volume heat and moisture extractor
29 assembly so that the freshly printed ink or coating material is
30 dry before the sheet is printed or coated on the next printing
31 unit. This quick drying process permits a base layer or film of
32 ink, for example opaque white or metallic (gold, silver or other
33 metallics) ink to be printed on the first printing unit, and then
34 overprinted on the next printing unit without back-trapping or dot
35 gain.

1 The construction and operation of the present invention
2 will be understood from the following detailed description taken
3 in conjunction with the accompanying drawings which disclose, by
4 way of example, the principles and advantages of the present
5 invention.

6 Brief Description of the Drawings

7 FIGURE 1 is a perspective view of a sheet fed, rotary
8 offset printing press having inking/coating apparatus embodying
9 the present invention;

10 FIGURE 2 is a simplified perspective view of the single
11 head, dual cradle inking/coating apparatus of the present
12 invention;

13 FIGURE 3 is a schematic side elevational view of the
14 printing press of Figure 1 having single head, dual cradle ink-
15 ing/coating apparatus installed in the traditional dampener
16 position of the first, second and last printing units;

17 FIGURE 4 is a simplified side elevational view showing
18 the single head, dual cradle inking/coating apparatus in the
19 operative inking/coating position for simultaneously printing on
20 the printing plate and blanket on the fourth printing unit;

21 FIGURE 5 is a simplified side elevational view showing
22 the single head, dual cradle inking/coating apparatus in the
23 operative position for spot or overall inking or coating on the
24 blanket of the first printing unit, and showing the dual cradle
25 inking/coating apparatus in the operative position for spot or
26 overall inking or coating on the printing plate of the second
27 printing unit;

28 FIGURE 6 is a simplified side elevational view of the
29 single head, dual cradle inking/coating apparatus of FIGURE 4 and
30 FIGURE 5, partially broken away, showing the single head, dual
31 cradle inking/coating apparatus in the operative coating position
32 and having a sealed doctor blade reservoir assembly for spot or
33 overall coating on the blanket;

FIGURE 7 is a schematic view showing a heat exchanger and pump assembly connected to the single head, dual cradle inking/coating apparatus for circulating temperature controlled ink or coating material to the inking/coating apparatus;

FIGURE 8 is a side elevational view, partially broken away, and similar to FIGURE 6 which illustrates an alternative coating head arrangement;

FIGURE 9 is a simplified elevational view of a printing unit which illustrates pivotal coupling of the inking/coating apparatus on the printing unit side frame members;

FIGURE 10 is a view similar to FIGURE 2 in which a pair of split applicator rollers are mounted in the upper cradle and lower cradle, respectively;

FIGURE 11 is a side elevational view of a split applicator roller;

FIGURE 12 is a perspective view of a doctor blade reservoir which is centrally partitioned by a seal element;

FIGURE 13 is a sectional view showing sealing engagement of the split applicator roller against the partition seal element of FIGURE 12;

FIGURE 14 is a view similar to FIGURE 8 which illustrates an alternative inking/coating embodiment;

FIGURE 15 is a simplified side elevational view of a substrate which has a bronzed-like finish which is applied by simultaneous operation of the dual applicator roller embodiment of FIGURE 14;

FIGURE 16 is a side elevational view, partly in section, of a pan roller having separate transfer surfaces mounted on a split fountain pan;

FIGURE 17 is a simplified side elevational view of the dual cradle inking/coating apparatus, partially broken away, which illustrates an alternative inking/coating head apparatus featuring a single doctor blade assembly, anilox applicator roller mounted on the lower cradle; and

1 FIGURE 18 is a side elevational view, partly in section,
2 of a single doctor blade anilox applicator roller assembly having
3 separate transfer surfaces, and a split fountain pan having
4 separate fountain compartments, with the separate fountain
5 compartments being supplied with different inks or coating
6 materials from separate off-press sources.

7 Detailed Description of the Preferred Embodiments

8 As used herein, the term "processed" refers to printing
9 and coating methods which can be applied to either side of a
10 substrate, including the application of lithographic, waterless,
11 UV-curable, aqueous and flexographic inks and/or coatings. The
12 term "substrate" refers to sheet and web material. Also, as used
13 herein, the term "waterless printing plate" refers to a printing
14 plate having image areas and non-image areas which are oleophilic
15 and oleophobic, respectively. "Waterless printing ink" refers to
16 an oil-based ink which does not contain a significant aqueous
17 component. "Flexographic plate" refers to a flexible printing
18 plate having a relief surface which is wettable by flexographic
19 ink or coating material. "Flexographic printing ink or coating
20 material" refers to an ink or coating material having a base
21 constituent of either water, solvent or UV-curable liquid. "UV-
22 curable lithographic printing ink and coating material" refers to
23 oil-based printing inks and coating materials that can be cured
24 (dried) photomechanically by exposure to ultraviolet radiation,
25 and that have a semi-paste or gel-like consistency. "Aqueous
26 printing ink or coating material" refers to an ink or coating
27 material that predominantly contains water as a solvent, diluent
28 or vehicle. A "relief plate" refers to a printing plate having
29 image areas which are raised relative to non-image areas which are
30 recessed.

31 As shown in the exemplary drawings, the present
32 invention is embodied in a new and improved in-line inking/coating
33 apparatus, herein generally designated 10, for applying aqueous,
34 flexographic or UV-curable inks or protective and/or decorative

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1 coatings to sheets or webs printed in a sheet-fed or web-fed,
2 rotary offset printing press, herein generally designated 12. In
3 this instance, as shown in FIGURE 1, the inking/coating apparatus
4 10 is installed in a four unit rotary offset printing press 12,
5 such as that manufactured by Heidelberger Druckmaschinen AG of
6 Germany under its designation Heidelberg Speedmaster SM102 (40",
7 102cm).

8 The press 12 includes a press frame 14 coupled at one
9 end, herein the right end, to a sheet feeder 16 from which sheets,
10 herein designated S, are individually and sequentially fed into
11 the press, and at the opposite end, with a sheet delivery stacker
12 20 in which the freshly printed sheets are collected and stacked.
13 Interposed between the sheet feeder 16 and the sheet delivery
14 stacker 20 are four substantially identical sheet printing units
15 22, 24, 26 and 28 which can print four different colors onto the
16 sheets as they are transferred through the press 12. The printing
17 units are housed within printing towers T1, T2, T3 and T4 formed
18 by side frame members 14, 15. Each printing tower has a delivery
19 side 25 and a dampener side 27. A dampener space 29 is partially
20 enclosed by the side frames on the dampener side of the printing
21 unit.

22 As illustrated, the printing units 22, 24, 26 and 28 are
23 substantially identical and of conventional design. The first
24 printing unit 22 includes an in-feed transfer cylinder 30, a plate
25 cylinder 32, a blanket cylinder 34 and an impression cylinder 36,
26 all supported for rotation in parallel alignment between the press
27 side frames 14, 15 which define printing unit towers T1, T2, T3
28 and T4. Each of the first three printing units 22, 24 and 26 have
29 a transfer cylinder 38 disposed to transfer the freshly printed
30 sheets from the adjacent impression cylinder and transfer the
31 freshly printed sheets to the next printing unit via an intermedi-
32 ate transfer drum 40.

33 The last printing unit 28 includes a delivery cylinder
34 42 mounted on a delivery shaft 43. The delivery cylinder 42
35 supports the freshly printed sheet 18 as it is transferred from

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1 the last impression cylinder 36 to a delivery conveyor system,
2 generally designated 44, which transfers the freshly printed sheet
3 to the sheet delivery stacker 20. To prevent smearing during
4 transfer, a flexible covering is mounted on the delivery cylinder
5 42, as described and claimed in U.S. Patent 4,402,267 to Howard W.
6 DeMoore, which is incorporated herein by reference. The flexible
7 covering is manufactured and sold by Printing Research, Inc. of
8 Dallas, Texas, U.S.A., under its trademark SUPER BLUE®. Optional-
9 ly, a vacuum-assisted sheet transfer assembly manufactured and
10 sold by Printing Research, Inc. of Dallas, Texas, U.S.A., under
11 its trademark BACVAC® can be substituted for the delivery transfer
12 cylinder 42 and flexible covering.

13 The delivery conveyor system 44 as shown in FIGURE 2 is
14 of conventional design and includes a pair of endless delivery
15 gripper chains 46, only one of which is shown carrying at regular
16 spaced locations along the chains, laterally disposed gripper bars
17 having gripper fingers used to grip the leading edge of a freshly
18 printed or coated sheet 18 after it leaves the nip between the
19 impression cylinder 36 and delivery cylinder 42 of the last
20 printing unit 28. As the leading edge is gripped by the gripper
21 fingers, the delivery chains 46 pull the sheet away from the last
22 impression cylinder 36 and convey the freshly printed or coated
23 sheet to the sheet delivery stacker 20.

24 Prior to reaching the delivery sheet stacker, the
25 freshly printed and/or coated sheets S pass under a delivery dryer
26 48 which includes a combination of infra-red thermal radiation,
27 high velocity hot air flow and a high performance heat and
28 moisture extractor for drying the ink and/or the protec-
29 tive/decorative coating. Preferably, the delivery dryer 48,
30 including the high performance heat and moisture extractor is
31 constructed as described in U.S. Application Serial Number
32 08/116,711, filed September 3, 1993, entitled "Infra-Red Forced
33 Air Dryer and Extractor" by Howard C. Secor, Ronald M. Rendleman
34 and Paul D. Copenhaver, commonly assigned to the assignee of the
35 present invention, Howard W. DeMoore, and licensed to Printing

1 Research, Inc. of Dallas, Texas, U.S.A., which manufactures and
2 markets the delivery dryer 48 under its trademark AIR BLANKET™.

3 In the exemplary embodiment shown in FIGURE 3, the first
4 printing unit 22 has a flexographic printing plate PF mounted on
5 the plate cylinder, and therefore neither an inking roller train
6 nor a dampening system is required. A flexographic printing plate
7 PF is also mounted on the plate cylinder of the second printing
8 unit 24. The form rollers of the inking roller train 52 shown
9 mounted on the second printing unit 24 are retracted and locked
10 off to prevent plate contact. Flexographic ink is supplied to the
11 flexographic plate PF of the second printing unit 24 by the ink-
12 ing/coating apparatus 10.

13 A suitable flexographic printing plate PF is offered by
14 E.I. du Pont de Nemours of Wilmington, Delaware, U.S.A., under its
15 trademark CYREL®. Another source is BASF Aktiengesellschaft of
16 Ludwigshafen, Germany, which offers a suitable flexographic
17 printing plate under its trademark NYLOFLEX®.

18 The third printing unit 26 as illustrated in FIGURE 3
19 and FIGURE 4 is equipped for lithographic printing and includes an
20 inking apparatus 50 having an inking roller train 52 arranged to
21 transfer ink Q from an ink fountain 54 to a lithographic plate P
22 mounted on the plate cylinder 32. This is accomplished by a
23 fountain roller 56 and a ductor roller 57. The fountain roller 56
24 projects into the ink fountain 54, whereupon its surface picks up
25 ink. The lithographic printing ink Q is transferred from the
26 fountain roller 56 to the inking roller train 52 by the ductor
27 roller 57. The inking roller train 52 supplies ink Q to the image
28 areas of the lithographic printing plate P.

29 The lithographic printing ink Q is transferred from the
30 lithographic printing plate P to an ink receptive blanket B which
31 is mounted on the blanket cylinder 34. The inked image carried on
32 the blanket B is transferred to a substrate S as the substrate is
33 transferred through the nip between the blanket cylinder 34 and
34 the impression cylinder 36.

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1 The inking roller arrangement 52 illustrated in FIGURE
2 3 and FIGURE 4 is exemplary for use in combination with litho-
3 graphic ink printing plates P. It is understood that a dampening
4 system 58 having a dampening fluid reservoir DF is coupled to the
5 inking roller train 52 (FIGURE 4), but is not required for water-
6 less or flexographic printing.

7 The plate cylinder 32 of printing unit 28 is equipped
8 with a waterless printing plate PW. Waterless printing plates are
9 also referred to as dry planographic printing plates and are
10 disclosed in the following U.S. patents: 3,910,187; Re. 30,670;
11 4,086,093; and 4,853,313. Suitable waterless printing plates can
12 be obtained from Toray Industries, Inc. of Tokyo, Japan. A
13 dampening system is not used for waterless printing, and waterless
14 (oil-based) printing ink is used. The waterless printing plate PW
15 has image areas and non-image areas which are oleophilic/hydro-
16 philic and oleophobic/hydrophobic, respectively. The waterless
17 printing plate PW is engraved or etched, with the image areas
18 being recessed with respect to the non-image areas. The image
19 area of the waterless printing plate PW is rolled-up with the
20 flexographic or aqueous printing ink which is transferred by the
21 applicator roller 66. Both aqueous and oil-based inks and
22 coatings are repelled from the non-image areas, and are retained
23 in the image areas. The printing ink or coating is then trans-
24 ferred from the image areas to an ink or coating receptive blanket
25 B and is printed or coated onto a substrate S.

26 For some printing jobs, a flexographic plate PF or a
27 waterless printing plate PW is mounted over a resilient packing
28 such as the blanket B on the blanket cylinder 34, for example as
29 indicated by phantom lines in printing unit 22 of FIGURE 5. An
30 advantage of this alternative embodiment is that the waterless
31 plate PW or the flexographic plate PF are resiliently supported
32 over the blanket cylinder by the underlying blanket B or other
33 resilient packing. The radial deflection and give of the
34 resilient blanket B provides uniform, positive engagement between

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1 the applicator roller 66 and a flexographic plate or waterless
2 plate.

3 In that arrangement, a plate is not mounted on the plate
4 cylinder 32; instead, a waterless plate PW is mounted on the
5 blanket cylinder, and the inked image on the waterless printing
6 plate is not offset but is instead transferred directly from the
7 waterless printing plate PW to the substrate S. The water
8 component of flexographic ink on the freshly printed sheet is
9 evaporated by high velocity, hot air dryers and high volume heat
10 and moisture extractors so that the freshly printed aqueous or
11 flexographic ink is dried before the substrate is printed on the
12 next printing unit.

13 Referring now to FIGURE 2, FIGURE 3 and FIGURE 9, the
14 inking/coating apparatus 10 is pivotally mounted on the side
15 frames 14, 15 for rotation about an axis X. The inking/coating
16 apparatus 10 includes a frame 60, a hydraulic motor 62, a lower
17 gear train 64, an upper gear train 65, an applicator roller 66, a
18 sealed doctor blade assembly 68 (FIGURE 6), and a drip pan DP, all
19 mounted on the frame 60. The external peripheral surface of the
20 applicator roller 66 is wetted by contact with liquid coating
21 material or ink contained in a reservoir 70.

22 The hydraulic motor 62 drives the applicator roller 66
23 synchronously with the plate cylinder 32 and the blanket cylinder
24 34 in response to an RPM control signal from the press drive (not
25 illustrated) and a feedback signal developed by a tachometer 72.
26 While a hydraulic drive motor is preferred, other drive means such
27 as an electric drive motor or an equivalent can be used.

28 When using waterless printing plate systems, the
29 temperature of the waterless printing ink and of the waterless
30 printing plate must be closely controlled for good image reproduc-
31 tion. For example, for waterless offset printing with TORAY
32 waterless printing plates PW, it is absolutely necessary to
33 control the waterless printing plate surface and waterless ink
34 temperature to a very narrow range, for example 24°C (75°F) to
35 27°C (80°F).

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1 Referring to FIGURE 7, the reservoir 70 is supplied with
2 ink or coating which is temperature controlled by a heat exchanger
3 71. The temperature controlled ink or coating material is
4 circulated by a positive displacement pump, for example a
5 peristaltic pump, through the reservoir 70 and heat exchanger 71
6 from a source 73 through a supply conduit 75 and a return conduit
7 77. The heat exchanger 71 cools or heats the ink or coating
8 material and maintains the ink or coating and the printing plate
9 within the desired narrow temperature range.

10 According to one aspect of the present invention,
11 aqueous/flexographic ink or coating material is supplied to the
12 applicator roller 66, which transfers the aqueous/flexographic ink
13 or coating material to the printing plate (FIGURE 7), which may be
14 a waterless printing plate or a flexographic printing plate. When
15 the inking/coating apparatus is used for applying aqueous/flexo-
16 graphic ink or coating material to a waterless printing plate PW,
17 the inking roller train 52 is not required, and is retracted away
18 from the printing plate. Because the viscosity of aqueous/flexo-
19 graphic printing ink or coating material varies with temperature,
20 it is necessary to heat or cool the aqueous/flexographic printing
21 ink or coating material to compensate for ambient temperature
22 variations to maintain the ink viscosity in a preferred operating
23 range.

24 For example, the temperature of the printing press can
25 vary from around 60°F (15°C) in the morning, to around 85°F (29°C)
26 or more in the afternoon. The viscosity of aqueous/flexographic
27 printing ink or coating material can be marginally high when the
28 ambient temperature of the press is near 60°F (15°C), and the
29 viscosity can be marginally low when the ambient temperature of
30 the press exceeds 85°F (29°C). Consequently, it is desirable to
31 control the temperature of the aqueous/flexographic printing ink
32 or coating material so that it will maintain the surface tempera-
33 ture of waterless printing plates within the specified temperature
34 range. Moreover, the ink/coating material temperature should be
35 controlled to maintain the tack of the aqueous/flexographic

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1 printing ink or coating material within a desired range when the
2 ink or coating material is being used in connection with flexo-
3 graphic printing processes.

4 The applicator roller 66 is preferably an anilox fluid
5 metering roller which transfers measured amounts of printing ink
6 or coating material to a plate or blanket. The surface of an
7 anilox roller is engraved with an array of closely spaced, shallow
8 depressions referred as "cells". Ink or coating from the
9 reservoir 70 flows into the cells as the anilox roller turns
10 through the reservoir. The transfer surface of the anilox roller
11 is "doctored" (wiped or scraped) by dual doctor blades 68A, 68B to
12 remove excess ink or coating material. The ink or coating metered
13 by the anilox roller is that contained within the cells. The dual
14 doctor blades 68A, 68B also seal the supply reservoir 70.

15 The anilox applicator roller 66 is cylindrical and may
16 be constructed in various diameters and lengths, containing cells
17 of various sizes and shapes. The volumetric capacity of an anilox
18 roller is determined by cell size, shape and number of cells per
19 unit area. Depending upon the intended application, the cell
20 pattern may be fine (many small cells per unit area) or coarse
21 (fewer large cells per unit area).

22 By supplying the ink or coating material through the
23 inking/coating apparatus 10, more ink or coating material can be
24 applied to the sheet S as compared with the inking roller train of
25 a lithographic printing unit. Moreover, color intensity is
26 stronger and more brilliant because the aqueous or flexographic
27 ink or coating material is applied at a much heavier film
28 thickness or weight than can be applied by the lithographic
29 process, and the aqueous or flexographic colors are not diluted by
30 dampening solution.

31 Preferably, the sealed doctor blade assembly 68 is con-
32 structed as described in U.S. Patent 5,176,077 to Howard W.
33 DeMoore, co-inventor and assignee, which is incorporated herein by
34 reference. An advantage of using a sealed reservoir is that fast
35 drying ink or coating material can be used. Fast drying ink or

1 coating material can be used in an open fountain 53 (see FIGURE
2 8); however, open air exposure causes the water and solvents in
3 the fast-drying ink or coating material to evaporate faster, thus
4 causing the ink or coating material to dry prematurely and change
5 viscosity. Moreover, an open fountain emits unwanted odors into
6 the press room. When the sealed doctor blade assembly is
7 utilized, the pump (FIGURE 7) which circulates ink or coating
8 material to the doctor blade head is preferably a peristaltic
9 pump, which does not inject air into the feeder lines which supply
10 the ink or coating reservoir 70 and helps to prevent the formation
11 of air bubbles and foam within the ink or coating material.

12 An inking/coating apparatus 10 having an alternative
13 applicator roller arrangement is illustrated in FIGURES 10-13. In
14 this arrangement, the engraved metering surface of the anilox
15 applicator rollers 66, 67 are partitioned by smooth seal surfaces
16 66C which separates a first engraved peripheral surface portion
17 66A from a second engraved peripheral surface portion 66B.
18 Likewise, smooth seal surfaces 66D, 66E are formed on the opposite
19 end portions of the applicator roller 66 for engaging end seals
20 134, 136 (FIGURE 12) of the doctor blade reservoir. The upper
21 applicator roller 67 has engraved anilox metering surfaces 67A and
22 67B which are separated by a smooth seal band 67C.

23 Referring now to FIGURE 12 and FIGURE 13, the reservoir
24 70 of the doctor blade head 68 is partitioned by a curved seal
25 element 130 to form two separate chambers 70A, 70B. The seal
26 element 130 is secured to the doctor blade head within an annular
27 groove 132. The seal element 130 is preferably made of polyur-
28 ethane foam or other durable, resilient foam material. The seal
29 element 130 is engaged by the seal band 66, thus forming a rotary
30 seal which blocks the leakage of ink or coating material from one
31 reservoir chamber into the other reservoir chamber. Moreover, the
32 seal band provides an unprinted or uncoated area which separates
33 the printed or coated areas from each other, which is needed for
34 work and turn printing jobs or other printing jobs which print two
35 or more separate images onto the same substrate.

1 Another advantage of the split applicator roller
2 embodiment is that it enables two or more flexographic inks or
3 coating materials to be printed simultaneously within the same
4 lithographic printing unit. That is, the reservoir chambers 70A,
5 70B of the upper doctor blade assembly can be supplied with gold
6 ink and silver ink, for example, while the reservoir chambers 70A,
7 70B of the lower doctor blade assembly can be supplied with inks
8 of two additional colors, for example opaque white ink and blue
9 ink. This permits the opaque white ink to be overprinted with the
10 gold ink, and the blue ink to be overprinted with the silver ink
11 on the same printing unit on any lithographic press.

12 Moreover, a catalyst can be used in the upper doctor
13 blade reservoir and a reactive ink or coating material can be used
14 in the lower doctor blade reservoir. This can provide various
15 effects, for example improved chemical resistance and higher gloss
16 levels.

17 The split applicator roller sections 67A, 67B in the
18 upper cradle position can be used for applying two separate inks
19 or coating materials simultaneously, for example flexographic,
20 aqueous and ultra-violet curable inks or coating materials, to
21 separate surface areas of the plate, while the lower applicator
22 roller sections 66A, 66B can apply an initiator layer and a micro-
23 encapsulated layer simultaneously to separate blanket surface
24 areas. Optionally, the metering surface portions 66A, 66B can be
25 provided with different cell metering capacities for providing
26 different printing effects which are being printed simultaneously.
27 For example, the screen line count on one half-section of an
28 anilox applicator roller is preferably in the range of 200-600
29 lines per inch (79-236 lines per cm) for half-tone images, and the
30 screen line count of the other half-section is preferably in the
31 range of 100-300 lines per inch (39-118 lines per cm) for overall
32 coverage, high weight applications such as opaque white. This
33 split arrangement in combination with dual applicator rollers is
34 particularly advantageous when used in connection with "work and
35 turn" printing jobs.

1 Referring again to FIGURE 8, instead of using the sealed
2 doctor blade reservoir assembly 68 as shown in FIGURE 6, an open
3 fountain assembly 69 is provided by the fountain pan 53 which
4 contains a volume of liquid ink Q or coating material. The liquid
5 ink or coating material is transferred to the applicator roller 66
6 by a pan roller 55 which turns in contact with ink Q or coating
7 material in the fountain pan. If a split applicator roller is
8 used, the pan roller 55 is also split, and the pan is divided into
9 two pan sections 53A, 53B by a separator plate 53P, as shown in
10 FIGURE 16.

11 In the alternative embodiment of FIGURE 16, the pan
12 roller 55 is divided into two pan roller sections 55A, 55B by a
13 centrally located, annular groove 59. The separator plate 53P is
14 received within and centrally aligned with the groove 59, but does
15 not touch the adjoining roller faces. By this arrangement, two or
16 more inks or coating materials Q1, Q2 are contained within the
17 open pan sections 55A, 55B for transfer by the split pan roller
18 sections 53A, 53B, respectively. This permits two or more
19 flexographic inks or coating materials to be transferred to two
20 separate image areas on the plate or on the blanket of the same
21 printing unit. This arrangement is particularly advantageous for
22 work and turn printing jobs or other printing jobs which print two
23 or more separate images onto the same substrate.

24 The frame 60 of the inking/coating apparatus 10 includes
25 side support members 74, 76 which support the applicator roller
26 66, gear train 64, gear train 65, doctor blade assembly 68 and the
27 drive motor 62. The applicator roller 66 is mounted on stub
28 shafts 63A, 63B which are supported at opposite ends on a lower
29 cradle assembly 100 formed by a pair of side support members 78,
30 80 which have sockets 79, 81 and retainer caps 101, 103. The stub
31 shafts are received in roller bearings 105, 107 which permit free
32 rotation of the applicator roller 66 about its longitudinal axis
33 A1 (axis A2 in the upper cradle). The retainer caps 101, 103 hold
34 the stub shafts 63A, 63B and bearings 105, 107 in the sockets 79,

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1 81 and hold the applicator roller 66 in parallel alignment with
2 the pivot axis X.

3 The side support members 74, 76 also have an upper
4 cradle assembly 102 formed by a pair of side support members 82,
5 84 which are vertically spaced with respect to the lower side
6 plates 78, 80. Each cradle 100, 102 has a pair of sockets 79, 81
7 and 83, 85, respectively, for holding an applicator roller 66, 67
8 for spot coating or inking engagement with the printing plate P on
9 the plate cylinder 32 (FIGURE 4) or with a printing plate P or a
10 blanket B on the blanket cylinder 34.

11 Preferably, the applicator roller 67 (FIGURE 8, FIGURE
12 9) the upper cradle (plate) position is an anilox roller having a
13 resilient transfer surface. In the dual cradle arrangement as
14 shown in FIGURE 2, the press operator can quickly change from
15 blanket inking/coating to plate inking/coating within minutes,
16 since it is only necessary to release, remove and reposition or
17 replace the applicator roller 66.

18 The capability to simultaneously print in the flexo-
19 graphic mode, the aqueous mode, the waterless mode, or the litho-
20 graphic mode on different printing units of the same lithographic
21 press and to print or coat from either the plate position or the
22 blanket position on any one of the printing units is referred to
23 herein as the LITHOFLEX™ printing process or system. LITHOFLEX™
24 is a trademark of Printing Research, Inc. of Dallas, Texas,
25 U.S.A., exclusive licensee of the present invention.

26 Referring now to FIGURE 14, an inking/coating apparatus
27 10 having an inking/coating assembly 109 of an alternative design
28 is installed in the upper cradle position for applying ink and/or
29 coating material to a plate P on the plate cylinder 32. According
30 to this alternative embodiment, an applicator roller 67R having a
31 resilient transfer surface is coupled to an anilox fluid metering
32 roller which transfers measured amounts of printing ink or coating
33 material to the plate P. The anilox roller 111 has a transfer
34 surface constructed of metal, ceramic or composite material which
35 is engraved with cells. The resilient applicator roller 67R is

1 interposed in transfer engagement with the plate P and the
2 metering surface of the anilox roller 111. The resilient transfer
3 surface of the applicator roller 67R provides uniform, positive
4 engagement with the plate.

5 Referring now to FIGURE 17, an inking/coating apparatus
6 10 having an alternative inking/coating assembly 113 is installed
7 in the lower cradle assembly 100 for applying flexographic or
8 aqueous ink and/or coating material Q to a plate or blanket
9 mounted on the blanket cylinder 34. Instead of using the sealed,
10 dual doctor blade reservoir assembly 68 as shown in FIGURE 6, an
11 open, single doctor blade anilox roller assembly 113 is supplied
12 with liquid ink Q or coating material contained in an open
13 fountain pan 117. The liquid ink or coating material Q is
14 transferred to the engraved transfer surface of the anilox roller
15 66 as it turns in the fountain pan 117. Excess ink or coating
16 material Q is removed from the engraved transfer surface by a
17 single doctor blade 68B. The liquid ink or coating material Q is
18 pumped from an off-press source, for example the drum 73 shown in
19 FIGURE 17, through a supply conduit 119 into the fountain pan 117
20 by a pump 120.

21 For overall inking or coating jobs, the metering
22 transfer surface of the anilox roller 66 extends over its entire
23 peripheral surface. However, for certain printing jobs which
24 print two or more separate images onto the same substrate, for
25 example work and turn printing jobs, the metering transfer surface
26 of the anilox applicator roller 66 is partitioned by a centrally
27 located, annular undercut groove 66C which separates first and
28 second metering transfer surfaces 66A, 66B as shown in FIGURE 11
29 and FIGURE 18.

30 The single doctor blade 68B has an edge 68E which wipes
31 simultaneously against the split metering transfer surfaces 66A,
32 66B. In this single blade, split anilox roller embodiment 113, it
33 is necessary to provide dual supply sources, for example drums
34 73A, 73B, dual supply lines 119A, 119B, and dual pumps 120A, 120B.
35 Moreover, the fountain pan 117 is also split, and the pan 117 is

1 divided into two pan sections 117A, 117B by a separator plate 121,
2 as shown in FIGURE 18. The separator plate 121 is centrally
3 aligned with the undercut groove 66C, but does not touch the
4 adjoining roller faces.

5 Although the single blade, split anilox applicator
6 roller assembly 113 is shown mounted in the lower cradle position
7 (FIGURE 17), it should be understood that the single blade, split
8 anilox applicator roller assembly 113 can be mounted and used in
9 the upper cradle position, as well.

10 According to another aspect of the present invention,
11 the inking/coating apparatus 10 is pivotally coupled on horizontal
12 pivot pins 88P, 90P which allows the single head, dual cradle ink-
13 ing/coating apparatus 10 to be mounted on any lithographic
14 printing unit. Referring to FIGURE 9, the horizontal pivot pins
15 88P, 90P are mounted within the traditional dampener space 29 of
16 the printing unit and are secured to the press side frames 14, 15,
17 respectively. Preferably, the pivot support pins 88P, 90P are
18 secured to the press side frames by a threaded fastener. The
19 pivot support pins are received within circular openings 88, 90
20 which intersect the side support members 74, 76 of the ink-
21 ing/coating apparatus 10. The horizontal support pins 88P, 90P
22 are disposed in parallel alignment with rotational axis X and with
23 the plate cylinder and blanket cylinder, and are in longitudinal
24 alignment with each other.

25 Preferably, the pivot pins 88P, 90P are located in the
26 dampener space 29 so that the rotational axes A1, A2 of the
27 applicator rollers 66, 67 are elevated with respect to the nip
28 contact points N1, N2. By that arrangement, the transfer point
29 between the applicator roller 66 and a blanket on the blanket
30 cylinder 34 (as shown in FIGURE 8) and the transfer point between
31 the applicator roller 66 and a plate on the plate cylinder 32 (as
32 shown in FIGURE 5) are above the radius lines R1, R2 of the plate
33 cylinder and the blanket cylinder, respectively. This permits the
34 inking/coating apparatus 10 to move clockwise to retract the
35 applicator roller 66 to an off-impression position relative to the

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1 blanket cylinder in response to a single extension stroke of the
2 power actuator arms 104A, 106A. Similarly, the applicator roller
3 66 is moved counterclockwise to the on-impression operative
4 position, as shown in FIGURES 4, 5, 6 and 8 by a single retraction
5 stroke of the actuator arms 104A, 106A, respectively.

6 Preferably, the pivot pins are made of steel and the
7 side support members are made of aluminum, with the steel pivot
8 pins and the aluminum collar portion bordering the circular
9 openings 88, 90 forming a low friction journal. By this arrange-
10 ment, the inking/coating apparatus 10 is freely rotatable
11 clockwise and counterclockwise with respect to the pivot pins 88P,
12 90P. Typically, the arc length of rotation is approximately 60
13 mils (about 1.5 mm). Consequently, the inking/coating apparatus
14 10 is almost totally enclosed within the dampener space 29 of the
15 printing unit in the on-impression position and in the off-
16 impression position.

17 The cradle assemblies 100 and 102 position the applica-
18 tor roller 66 in inking/coating alignment with the plate cylinder
19 or blanket cylinder, respectively, when the inking/coating
20 apparatus 10 is extended to the operative (on-impression)
21 position. Moreover, because the inking/coating apparatus 10 is
22 installed within the dampener space 29, it is capable of freely
23 rotating through a small arc while extending and retracting
24 without being obstructed by the press side frames or other parts
25 of the printing press. This makes it possible to install the ink-
26 ing/coating apparatus 10 on any lithographic printing unit.
27 Moreover, because of its internal mounting position within the
28 dampener space 29, the projection of the inking/coating apparatus
29 10 into the space between printing units is minimal. This assures
30 unrestricted operator access to the printing unit when the
31 applicator head is in the operative (on-impression) and retracted
32 (off-impression) positions.

33 As shown in FIGURE 4 and FIGURE 5, movement of the
34 inking/coating apparatus 10 is counterclockwise from the retracted

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1 (off-impression) position to the operative (on-impression)
2 position.

3 Although the dampener side installation is preferred,
4 the inking/coating apparatus 10 can be adapted for operation on
5 the delivery side of the printing unit, with the inking/coating
6 apparatus being movable from a retracted (off-impression) position
7 to an on-impression position for engagement of the applicator
8 roller with either a plate on the plate cylinder or a blanket on
9 the blanket cylinder on the delivery side 25 of the printing unit.

10 Movement of the inking/coating apparatus 10 to the
11 operative (on-impression) position is produced by power actuators,
12 preferably double acting pneumatic cylinders 104, 106 which have
13 extendable/retractable power transfer arms 104A, 106A, respective-
14 ly. The first pneumatic cylinder 104 is pivotally coupled to the
15 press frame 14 by a pivot pin 108, and the second pneumatic
16 cylinder 106 is pivotally coupled to the press frame 15 by a pivot
17 pin 110. In response to selective actuation of the pneumatic
18 cylinders 104, 106, the power transfer arms 104A, 106A are
19 extended or retracted. The power transfer arm 104A is pivotally
20 coupled to the side support member 74 by a pivot pin 112.
21 Likewise, the power transfer arm 106A is pivotally coupled to the
22 side support member 76 by a pivot pin 114.

23 As the power arms extend, the inking/coating apparatus
24 10 is rotated clockwise on the pivot pins 88P, 90P, thus moving
25 the applicator roller 66 to the off-impression position. As the
26 power arms retract, the inking/coater apparatus 60 is rotated
27 counterclockwise on the pivot pins 88P, 90P, thus moving the
28 applicator roller 66 to the on-impression position. The torque
29 applied by the pneumatic actuators is transmitted to the ink-
30 ing/coating apparatus 10 through the pivot pin 112 and pivot pin
31 114.

32 Fine adjustment of the on-impression position of the
33 applicator roller relative to the plate cylinder or the blanket
34 cylinder, and of the pressure of roller engagement, is provided by
35 an adjustable stop assembly 115. The adjustable stop assembly 115

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1 transfer drum 40 of one printing unit and to another transfer
2 cylinder 30 and to the impression cylinder 36 of the next printing
3 unit. By that arrangement, the freshly printed flexographic ink
4 or coating material is dried before the substrate S is overprinted
5 by the next printing unit.

6 The high velocity, hot air dryer and high performance
7 heat and moisture extractor units 124, 126 and 128 utilize high
8 velocity air jets which scrub and break-up the moist air layer
9 which clings to the surface of each freshly printed or coated
10 sheet or web. Within each dryer, high velocity air is heated as
11 it flows across a resistance heating element within an air
12 delivery baffle tube. High velocity jets of hot air are dis-
13 charged through multiple airflow apertures into an exposure zone
14 Z (FIGURE 4 and FIGURE 5) and onto the freshly printed/coated
15 sheet S as it is transferred by the impression cylinder 36 and
16 transfer drum 40, respectively.

17 Each dryer assembly includes a pair of air delivery
18 dryer heads 124D, 126D and 128D which are arranged in spaced,
19 side-by-side relationship. The high velocity, hot air dryer and
20 high performance heat and moisture extractor units 124, 126 and
21 128 are preferably constructed as disclosed in co-pending U.S.
22 Patent Application Serial No. 08/132,584, filed October 6, 1993,
23 entitled "High Velocity Hot Air Dryer", to Howard W. DeMoore, co-
24 inventor and assignee of the present invention, and which is
25 incorporated herein by reference, and which is marketed by
26 Printing Research, Inc. of Dallas, Texas, U.S.A., under its
27 trademark SUPER BLUE HV™.

28 The hot moisture-laden air displaced from the surface of
29 each printed or coated sheet is extracted from the dryer exposure
30 zone Z and exhausted from the printing unit by the high volume
31 extractors 124, 126 and 128. Each extractor head includes an
32 extractor manifold 124E, 126E and 128E coupled to the dryer heads
33 124D, 126D and 128D and draws the moisture, volatiles, odors and
34 hot air through a longitudinal air gap G between the dryer heads.
35 Best results are obtained when extraction is performed simulta-

neously with drying. Preferably, an extractor is closely coupled to the exposure zone Z at each dryer location as shown in FIGURE 4. Extractor heads 124E, 126E and 128E are mounted on the dryer heads 124D, 126D and 128D, respectively, with the longitudinal extractor air gap G facing directly into the exposure zone Z. According to this arrangement, each printed or coated sheet is dried before it is printed on the next printing unit.

The aqueous water-based inks used in flexographic printing evaporate at a relatively moderate temperature provided by the interunit high velocity hot air dryers/extractors 124, 126 and 128. Sharpness and print quality are substantially improved since the flexographic ink or coating material is dried before it is overprinted on the next printing unit. Since the freshly printed flexographic ink is dry, dot gain is substantially reduced and back-trapping on the blanket of the next printing unit is virtually eliminated. This interunit drying/extracting arrangement makes it possible to print flexographic inks such as metallic ink and opaque white ink on the first printing unit, and then dry-trap and overprint on the second and subsequent printing units.

Moreover, this arrangement permits the first printing unit 22 to be used as a coater in which a flexographic, aqueous or UV-curable coating material is applied to the lowest grade substrate such as recycled paper, cardboard, plastic and the like, to trap and seal-in lint, dust, spray powder and other debris and provide a smoother, more durable printing surface which can be overprinted on the next printing unit.

A first down (primer) aqueous coating layer seals-in the surface of a low grade, rough substrate, for example, re-cycled paper or plastic, and improves overprinted dot definition and provides better ink lay-down while preventing strike-through and show-through. A flexographic UV-curable coating material can then be applied downstream over the primer coating, thus producing higher coating gloss.

Preferably, the applicator roller 66 is constructed of composite carbon fiber material, metal or ceramic coated metal

1 when it is used for applying ink or coating material to the
2 blanket B or other resilient material on the blanket cylinder 34.
3 When the applicator roller 66 is applied to the plate, it is
4 preferably constructed as an anilox roller having a resilient,
5 compressible transfer surface. Suitable resilient roller surface
6 materials include Buna N synthetic rubber and EPDM (terpolymer
7 elastomer).

8 It has been demonstrated in prototype testing that the
9 inking/coating apparatus 10 can apply a wide range of ink and
10 coating types, including fluorescent (Day Glo), pearlescent,
11 metallics (gold, silver and other metals), glitter, scratch and
12 sniff (micro-encapsulated fragrance), scratch and reveal,
13 luminous, pressure-sensitive adhesives and the like, as well as
14 UV-curable and aqueous coatings.

15 With the dampener assembly removed from the printing
16 unit, the inking/coating apparatus 10 can easily be installed in
17 the dampener space for selectively applying flexographic inks
18 and/or coatings to a flexographic or waterless printing plate or
19 to the blanket. Moreover, overprinting of the flexographic inks
20 and coatings can be performed on the next printing unit since the
21 flexographic inks and/or coatings are dried by the high velocity,
22 hot air interunit dryer and high volume heat and moisture
23 extractor assembly of the present invention.

24 The flexographic inks and coatings as used in the
25 present invention contain colored pigments and/or soluble dyes,
26 binders which fix the pigments onto the surface of the substrate,
27 waxes, defoamers, thickeners and solvents. Aqueous printing inks
28 predominantly contain water as a diluent and/or vehicle. The
29 thickeners which are preferred include algonates, starch,
30 cellulose and its derivatives, for example cellulose esters or
31 cellulose ethers and the like. Coloring agents including organic
32 as well as inorganic pigments may be derived from dyes which are
33 insoluble in water and solvents. Suitable binders include
34 acrylates and/or polyvinylchloride.

1 When metallic inks are printed, the cells of the anilox
2 roller must be appropriately sized to prevent the metal particles
3 from getting stuck within the cells. For example, for metallic
4 gold ink, the anilox roller should have a screen line count in the
5 range of 175-300 lines per inch (68-118 lines per cm). Prefera-
6 bly, in order to keep the anilox roller cells clear, the doctor
7 blade assembly 68 is equipped with a bristle brush BR (FIGURE 14)
8 as set forth in U.S. Patent 5,425,809 to Steven M. Person,
9 assigned to Howard W. DeMoore, and licensed to Printing Research,
10 Inc. of Dallas, Texas, U.S.A., which is incorporated herein by
11 reference.

12 The inking/coating apparatus 10 can also apply UV-
13 curable inks and coatings. If UV-curable inks and coatings are
14 utilized, ultra-violet dryers/extractors are installed adjacent to
15 the high velocity hot air dryer/extractor units 124, 126 and 128,
16 respectively.

17 It will be appreciated that the LITHOFLEX™ printing
18 process described herein makes it possible to selectively operate
19 a printing unit of a press in the lithographic printing mode while
20 simultaneously operating another printing unit of the same press
21 in either the flexographic printing mode or in the waterless
22 printing mode, while also providing the capability to print or
23 coat, separately or simultaneously, from either the plate position
24 or the blanket position. The dual cradle support arrangement of
25 the present invention makes it possible to quickly change over
26 from inking/coating on the blanket cylinder position to ink-
27 ing/coating on the plate cylinder position with minimum press
28 down-time, since it is only necessary to remove and reposition or
29 replace the applicator roller 66 while the inking/coating
30 apparatus 10 is in the retracted position. It is only necessary
31 to remove four cap screws, lift the applicator roller 66 from the
32 cradle, and reposition it in the other cradle. All of this can be
33 accomplished in a few minutes, without removing the inking/coating
34 apparatus 10 from the press.

1 It is possible to spot coat or overall coat from the
2 plate position or from the blanket position with flexographic inks
3 or coatings on one printing unit and then spot coat or overall
4 coat with UV-curable inks or coatings from the plate position or
5 from the blanket position on another printing unit during the same
6 press run. Moreover, the press operator can spot or overall coat
7 from the plate for one job, and then spot and/or overall coat from
8 the blanket on the next job.

9 The positioning of the applicator roller relative to the
10 plate or blanket is repeatable to a predetermined preset operative
11 position. Consequently, only minor printing unit modifications or
12 alterations may be required for the LITHOFLEX™ process. Although
13 automatic extension and retraction have been described in
14 connection with the exemplary embodiment, extension to the
15 operative (on-impression) position and retraction to a non-
16 operative (off-impression) position can be carried out manually,
17 if desired. In the manual embodiment, it is necessary to latch
18 the inking/coating apparatus 10 to the press side frames 14, 15 in
19 the operative (on-impression) position, and to mechanically prop
20 the inking/coating apparatus in the off-impression (retracted)
21 position.

22 Referring again to FIGURE 8, an applicator roller 66 is
23 mounted on the lower cradle assembly 100 by side support members
24 78, 80, and a second applicator roller 66 is mounted on the upper
25 cradle assembly 102 by side support members 82, 84. According to
26 this arrangement, the inking/coating apparatus 10 can apply
27 printing ink and/or coating material to a plate on the plate
28 cylinder, while simultaneously applying printing ink and/or
29 coating material to a plate or a blanket on the blanket cylinder
30 of the same printing unit. When the same color ink is used by the
31 upper and lower applicator rollers from the plate position and
32 from the blanket position simultaneously on the same printing
33 unit, a "double bump" or double inking films or coating layers are
34 applied to the substrate S during a single pass of the substrate
35 through the printing unit. The tack of the two inks or coating

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1 materials must be compatible for good transfer during the double
2 bump. Moreover, the inking/coating apparatus 10 can be used for
3 supplying ink or coating material to the blanket cylinder of a
4 rotary offset web press, or to the blanket of a dedicated coating
5 unit.

6 According to conventional bronzing techniques, a
7 metallic (bronze) powder is applied off-line to previously printed
8 substrate which produces a grainy, textured finish or appearance.
9 The on-line application of bronze material by conventional flexo-
10 graphic or lithographic printing will only produce a smooth,
11 continuous appearance. However, a grainy, textured finish is
12 preferred for highest quality printing which, prior to the present
13 invention, could only be produced by off-line methods.

14 Referring now to FIGURE 14 and FIGURE 15, metallic ink
15 or coating material is applied on-line to the substrate S by
16 simultaneous operation of the upper and lower applicator rollers
17 67R, 66 to produce an uneven surface finish having a bronze-like
18 textured or grainy appearance. According to the simulated
19 bronzing method of the present invention, the flexographic bronze
20 ink is applied simultaneously to the plate and to the blanket by
21 the dual cradle inking/coating apparatus 10 as shown in FIGURE 14.
22 A resilient applicator roller 67R is mounted in the upper cradle
23 102, and an anilox applicator roller 66 is mounted on the lower
24 cradle 100. The rollers are supplied from separate doctor blade
25 reservoirs 70. The doctor blade reservoir 70 in the upper cradle
26 position supplies bronze ink or coating material having relatively
27 coarse, metallic particles 140 dispersed in aqueous or flexo-
28 graphic ink. The coarse particle ink or coating material is
29 applied to the plate P by the resilient applicator roller 67R in
30 the upper cradle position 102. At the same time, flexographic
31 and/or bronze ink or coating material having relatively fine,
32 metallic particles 142 is transferred to the blanket B by the
33 anilox roller 66 which is mounted on the lower cradle 100.

34 The metering surfaces of the upper and lower applicator
35 rollers have different cell sizes and volumetric capacities which

1 accommodate the coarse and fine metallic particles. For example,
2 the anilox roller 111 mounted in the upper cradle position 102
3 which transfers the coarse metallic particles 140 preferably has
4 a screen line count in the range of 100-300 lines per inch (39-118
5 lines per cm), and the metering surface of the anilox roller 66
6 mounted on the lower cradle 100 which transfers the relatively
7 fine metallic particles 142 preferably has a screen line count in
8 the range of 200-600 lines per inch (79-236 lines per cm).

9 After transfer from the plate to the blanket, the fine
10 metallic particles 142 form a layer over the coarse metallic
11 particles 140. As both bronze layers are offset onto the
12 substrate S, the layer of fine metallic particles 142 is printed
13 onto the substrate S with the top layer of coarse metallic
14 particles 140 providing a textured, grainy appearance. The fine
15 metallic particles 142 cover the substrate which would otherwise
16 be visible in the gaps between the coarse metallic particles 140.
17 The combination of the coarse particle layer over the fine
18 particle layer thus provides a textured, bronzed-like finish and
19 appearance.

20 Particulate materials other than metal can be used for
21 producing a textured finish. For example, coarse and fine
22 particles of metallized plastic (glitter), mica particles
23 (pearlescent) and the like, can be substituted for the metallic
24 particles for producing unlimited surface variations, appearances
25 and effects. All of the particulate material, including the
26 metallic particles, are preferably in solid, flat platelet form,
27 and have a size dimension suitable for application by an anilox
28 applicator roller. Other particulate or granular material, for
29 example stone grit having irregular form and size, can be used to
30 good advantage.

31 Solid metal particles in platelet form, which are good
32 reflectors of light, are preferred for producing the bronzed-like
33 appearance and effect. However, various textured finishes, which
34 could have light-reflective properties, can be produced by using
35 granular materials such as stone grit. Most commonly used metals

1 include copper, zinc and aluminum. Other ductile metals can be
2 used, if desired. Moreover, the coarse and fine particles need
3 not be made of the same particulate material. Various effects and
4 textured appearances can be produced by utilizing diverse
5 particulate materials for the coarse particles and the fine
6 particles, respectively. Further, either fine or coarse particle
7 ink or coating material can be printed from the upper cradle
8 position, and either fine or coarse particle ink or coating
9 material can be printed from the lower cradle position, depending
10 on the special or surface finish that is desired.

11 It will be appreciated that the last printing unit 28
12 can be configured for additional inking/coating capabilities which
13 include lithographic, waterless, aqueous and flexographic
14 processes. Various substrate surface effects (for example double
15 bump or triple bump inking/coating or bronzing) can be performed
16 on the last printing unit. For triple bump inking/coating, the
17 last printing unit 28 is equipped with an auxiliary in-line inking
18 or coating apparatus 97 as shown in FIGURE 3 and FIGURE 4. The
19 in-line inking or coating apparatus 97 allows the application of
20 yet another film of ink or a protective or decorative layer of
21 coating material over any freshly printed or coated surface
22 effects or special treatments, thereby producing a triple bump.
23 The triple bump is achieved by applying a third film of ink or
24 layer of coating material over the freshly printed or coated
25 double bump simultaneously while the substrate is on the impres-
26 sion cylinder of the last printing unit.

27 When the in-line inking/coating apparatus 97 is
28 installed, it is necessary to remove the SUPER BLUE® flexible
29 covering from the delivery cylinder 42, and it is also necessary
30 to modify or convert the delivery cylinder 42 for inking/coating
31 service by mounting a plate or blanket B on the delivery cylinder
32 42, as shown in FIGURE 3 and FIGURE 4. Packing material is placed
33 under the plate or blanket B, thereby packing the plate or blanket
34 B at the correct packed-to-print radial clearance so that ink or
35 coating material will be printed or coated onto the freshly

1 printed substrate S as it transfers through the nip between the
2 plate or blanket B on the converted delivery cylinder 42 and the
3 last impression cylinder 36. According to this arrangement, a
4 freshly printed or coated substrate is overprinted or overcoated
5 with a third film or layer of ink or coating material simulta-
6 neously while a second film or layer of ink or coating material is
7 being over-printed or over-coated on the last impression cylinder
8 36.

9 The auxiliary inking/coating apparatus 97 and the
10 converted or modified delivery cylinder 42 are mounted on the
11 delivery drive shaft 43. The inking/coating apparatus 97 includes
12 an applicator roller, preferably an anilox applicator roller 97A,
13 for supplying ink or coating material to a plate or blanket B on
14 the modified or converted delivery cylinder 42. The in-line
15 inking/coating apparatus 97 and the modified or converted delivery
16 cylinder 42 are preferably constructed as described in U.S. Patent
17 5,176,077 to Howard W. DeMoore (co-inventor and assignee), which
18 is hereby incorporated by reference. The in-line inking/coating
19 apparatus 97 is manufactured and sold by Printing Research, Inc.
20 of Dallas, Texas, U.S.A., under its trademark SUPER BLUE EZ
21 COATER™.

22 After the delivery cylinder 42 has been modified or
23 converted for inking/coating service, and because of the reduced
24 nip clearance imposed by the plate or blanket B, the modified
25 delivery cylinder 42 can no longer perform its original function
26 of guiding and transferring the freshly printed or coated
27 substrate. Instead, the modified or converted delivery cylinder
28 42 functions as a part of the inking/coating apparatus 97 by
29 printing or coating a third down film of ink or layer of coating
30 material onto the freshly printed or coated substrate as it is
31 simultaneously printed or coated on the last impression cylinder
32 36. Moreover, the mutual tack between the second down ink film or
33 coating layer and the third down ink film or coating layer causes
34 the overprinted or overcoated substrate to cling to the plate or

1 blanket, thus opposing or resisting separation of the substrate
2 from the plate or blanket.

3 To remedy this problem, a vacuum-assisted transfer
4 apparatus 99 is mounted adjacent the modified or converted
5 delivery cylinder 42 as shown in FIGURE 3 and FIGURE 4. Another
6 purpose of the vacuum-assisted transfer apparatus 99 is to
7 separate the freshly overprinted or overcoated triple bump
8 substrate from the plate or blanket B as the substrate transfers
9 through the nip. The vacuum-assisted transfer apparatus 99
10 produces a pressure differential across the freshly overprinted or
11 overcoated substrate as it transfers through the nip, thus
12 producing a separation force onto the substrate and providing a
13 clean separation from the plate or blanket B.

14 The vacuum-assisted transfer apparatus 99 is preferably
15 constructed as described in U.S. Patent Nos. 5,113,255; 5,127,329;
16 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W.
17 DeMoore, co-inventor, which are incorporated herein by reference.
18 The vacuum-assisted transfer apparatus 99 is manufactured and sold
19 by Printing Research, Inc. of Dallas, Texas, U.S.A. under its
20 trademark BACVAC™.

21 Although the present invention and its advantages have
22 been described in detail, it should be understood that various
23 changes, substitutions and alterations can be made herein without
24 departing from the spirit and scope of the present invention as
defined by the appended claims.

1 1. A method for printing in a rotary offset press of
2 the type including first and second printing units, the first
3 printing unit having a flexographic printing plate, a blanket, an
4 impression cylinder and inking/coating applicator means for
5 applying aqueous or flexographic printing ink or coating material
6 to the flexographic printing plate and/or to the blanket,
7 comprising the following steps performed in succession in the
8 first printing unit:

9 applying a first spot or overall coating of aqueous
10 or flexographic printing ink or coating material to the flexo-
11 graphic printing plate;

12 transferring the aqueous or flexographic printing
13 ink or coating material from the flexographic printing plate to
14 the blanket;

15 applying a second spot or overall film of aqueous
16 or flexographic printing ink or layer of coating material to the
17 blanket;

18 transferring ink or coating material from the
19 blanket to a substrate as the substrate is transferred through the
20 nip between the blanket and the impression cylinder; and,

21 drying the aqueous or flexographic ink or coating
22 material on the freshly printed or coated substrate before the
23 substrate is printed, coated or otherwise processed on the second
printing unit.

1 2. The printing method as defined in claim 1,
2 including the steps:

3 applying a primer coating of an aqueous or
4 flexographic ink or coating material to a substrate in the first
5 printing unit;

6 trapping and sealing particulate material such as
7 dust, lint, anti-offset spray powder and the like under the primer
8 coating;

9 drying the primer coating on the substrate before
10 the substrate is printed or coated on the second printing unit;
11 and,
12 overprinting the freshly coated substrate in the
second printing unit.

1 3. The printing method as defined in claim 1,
2 wherein the drying step is performed by directing
3 heated air onto the freshly printed or coated substrate while the
4 freshly printed or coated substrate is in contact with the
impression cylinder of the first printing unit.

1 4. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an intermediate transfer cylinder disposed between
5 the first and second printing units; and,

6 drying the freshly printed or coated substrate
7 while said substrate is in contact with the intermediate transfer
cylinder.

1 5. The printing method as defined in claim 1, wherein:
2 the drying step is performed by directing heated
3 air onto the freshly printed or coated substrate while the freshly
4 printed or coated substrate is in contact with an impression
cylinder in the second printing unit.

1 6. The printing method as defined in claim 1, wherein
2 the drying step is performed by directing heated air from a dryer
3 onto the freshly printed or coated substrate, and including the
4 step:

5 extracting hot air, moisture and volatiles from an
6 exposure zone between the freshly printed or coated substrate and
7 the dryer while the freshly printed or coated substrate is in
contact with the impression cylinder of the first printing unit.

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1 7. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an intermediate transfer cylinder disposed between
5 the first and second printing units;
6 directing heated air from a dryer onto the freshly
7 printed or coated substrate while said substrate is in contact
8 with the intermediate transfer cylinder; and,
9 extracting hot air, moisture and volatiles from an
10 exposure zone between the freshly printed or coated substrate and
11 said dryer while the freshly printed or coated substrate is in
contact with the intermediate transfer cylinder.

1 8. The printing method as defined in claim 1,
2 including the steps:
3 transferring the freshly printed or coated
4 substrate to an impression cylinder on the second printing unit;
5 directing heated air from a dryer onto the freshly
6 printed or coated substrate while said substrate is in contact
7 with the impression cylinder of the second printing unit; and,
8 extracting hot air, moisture and volatiles from an
9 exposure zone between the freshly printed or coated substrate and
10 said dryer while said substrate is in contact with the impression
cylinder of the second printing unit.

1 9. A method for providing an uneven printed or coated
2 layer on a substrate in a rotary offset printing press of the type
3 including a printing unit having a plate cylinder, a flexographic
4 printing plate mounted on the plate cylinder, a blanket cylinder,
5 a plate or blanket mounted on the blanket cylinder, an impression
6 cylinder and applicator means for applying aqueous or flexographic
7 printing ink or coating material to the flexographic printing
8 plate and/or to the plate or blanket on the blanket cylinder,
9 comprising the following steps performed in succession in the
10 printing unit:

11 applying a first down layer of aqueous or flexo-
12 graphic ink or coating material containing relatively coarse
13 particles to the flexographic plate;
14 transferring the relatively coarse particle
15 printing ink or coating material from the flexographic printing
16 plate to the plate or blanket on the blanket cylinder;
17 applying a second down layer of aqueous or
18 flexographic printing ink or coating material containing relative-
19 ly fine particles onto the relatively coarse particle printing ink
20 or coating material;
21 transferring the coarse and fine particle ink or
22 coating material from the blanket or plate on the blanket cylinder
23 onto a substrate as the substrate is transferred through the nip
24 between the blanket cylinder and the impression cylinder; and,
25 drying the freshly printed or coated substrate
26 before the freshly printed or coated substrate is subsequently
printed, coated or otherwise processed.

10. The method as set forth in claim 9, wherein the
coarse and fine particles comprise a metal selected from the group
including copper, zinc and aluminum.

11. The method as set forth in claim 9, wherein the
coarse and fine particles comprise a non-metallic material
selected from the group consisting of mica, silicon, stone grit
and plastic.

12. The method as set forth in claim 9, wherein the
coarse and fine particles comprise diverse particulate materials,
respectively.

13. A method for printing or coating a substrate on the
last printing unit of a rotary offset printing press of the type
including a plate cylinder, a printing plate mounted on the plate
cylinder, a blanket cylinder, a plate or blanket mounted on the

5 blanket cylinder, an impression cylinder, inking/coating apparatus
6 for applying printing ink or coating material simultaneously or
7 separately to the flexographic printing plate and/or to the plate
8 or blanket on the blanket cylinder, and including an ink-
9 ing/coating cylinder mounted adjacent the last printing unit for
10 printing a film of ink or layer of coating material over a freshly
11 printed substrate, comprising the steps:

12 applying a first down film of printing ink or layer
13 of coating material to the printing plate;

14 transferring printing ink or coating material from
15 the printing plate to a plate or blanket on the blanket cylinder;

16 applying a second down film of printing ink or
17 layer of coating material over the first down film or layer on the
18 plate or blanket on the blanket cylinder;

19 transferring ink or coating material from the
20 blanket or plate on the blanket cylinder onto a substrate as the
21 substrate is transferred through the nip between the blanket
22 cylinder and the impression cylinder; and

23 simultaneously printing a third down film of
24 printing ink or layer of coating material over the second down
25 film of ink or layer of coating material while the second down
26 film or layer is being printed or coated on the last impression
cylinder.

1 14. A method for printing or coating a substrate in a
2 rotary offset printing press of the type including a printing unit
3 having a plate cylinder, a flexographic printing plate mounted on
4 the plate cylinder, a blanket cylinder, a plate or blanket mounted
5 on the blanket cylinder, an impression cylinder, and ink-
6 ing/coating apparatus for applying flexographic or aqueous
7 printing ink or coating material to the flexographic printing
8 plate and/or to the plate or blanket on the blanket cylinder,
9 comprising the following steps:

10 applying a first down film or layer of flexographic
11 or aqueous printing ink or coating material to the flexographic
12 printing plate;
13 transferring printing ink or coating material from
14 the flexographic printing plate to the plate or blanket on the
15 blanket cylinder;
16 applying a second down film or layer of aqueous or
17 flexographic printing ink or coating material over the first down
18 film or layer on the plate or blanket on the blanket cylinder;
19 transferring ink or coating material from the
20 blanket or plate on the blanket cylinder onto a substrate as the
21 substrate is transferred through the nip between the blanket
22 cylinder and the impression cylinder; and,
23 drying the freshly printed or coated substrate
24 before the substrate is subsequently printed, coated or otherwise
processed.

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TOTAL 150.00/5960

1 15. A method of printing or coating a substrate in a
2 rotary offset printing press as set forth in claim 14, wherein the
3 printing unit is the last printing unit of the rotary offset
4 printing press and a delivery cylinder is mounted on the last
5 printing unit for transferring the freshly printed substrate along
6 a substrate travel path, including the steps:
7 modifying the delivery cylinder by mounting a plate
8 or blanket on the delivery cylinder;
9 transferring ink or coating material to the plate
10 or blanket on the modified delivery cylinder; and
11 transferring a third down film or layer of aqueous
12 or flexographic printing ink or coating material from the plate or
13 blanket over the second down film or layer simultaneously while
14 the freshly printed or coated substrate is on the last impression
cylinder of the last printing unit.

1 16. A method for rotary offset printing as defined in
2 any one of claims 1, 9, 13 or 14, including the steps:

3 circulating liquid ink or coating material from a
4 supply container to said inking/coating applicator means and from
5 said inking/coating applicator means to the supply container; and,
6 heating or cooling the liquid ink or coating
material as it is circulated.

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"RETRACTABLE PRINTING/COATING UNIT OPERABLE ON THE PLATE
AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER
SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE
PRINTING UNIT OF ANY ROTARY OFFSET PRINTING PRESS"

Abstract of the Disclosure

1 A retractable in-line inking/coating apparatus can apply
2 either spot or overall inking/coating material to a plate and/or
3 a blanket on the first printing unit or on any consecutive
4 printing unit of any rotary offset printing press. The ink-
5 ing/coating apparatus is pivotally mounted within the conventional
6 dampener space of any lithographic printing unit. The aqueous
7 component of the flexographic printing ink or aqueous coating
8 material is evaporated and dried by high velocity, hot air dryers
9 and high performance heat and moisture extractors so that the
10 aqueous or flexographic ink or coating material on a freshly
11 printed or coated sheet is dry and can be dry-trapped on the next
12 printing unit. The inking/coating apparatus includes dual cradles
13 that support first and second applicator rollers so that the ink-
14 ing/coating apparatus can apply a double bump of aque-
15 ous/flexographic or UV-curable printing ink or coating material to
16 a plate on the plate cylinder, while simultaneously applying
17 aqueous, flexographic or UV-curable printing ink or coating
18 material to a plate or a blanket on the blanket cylinder, and
19 thereafter onto a sheet as the sheet is transferred through the
20 nip between the blanket cylinder and the impression cylinder. A
21 triple bump is printed or coated on the last printing unit with
22 the aid of an impression cylinder inking/coating unit.

* * * * *

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FIG. 2

Figure 1 consists of 15 small plots labeled (a) through (o). Each plot shows a different parameter on the y-axis against the number of fish (N) on the x-axis. The parameters include age, sex ratio, weight, length, condition factor, survival rates at different stages, fecundity, hatching success, larval survival, juvenile survival, adult survival, total survival, mean length, mean weight, and mean condition factor. Most plots show a general downward trend as N increases, indicating that these parameters decrease as the number of fish increases.

FIG. 3

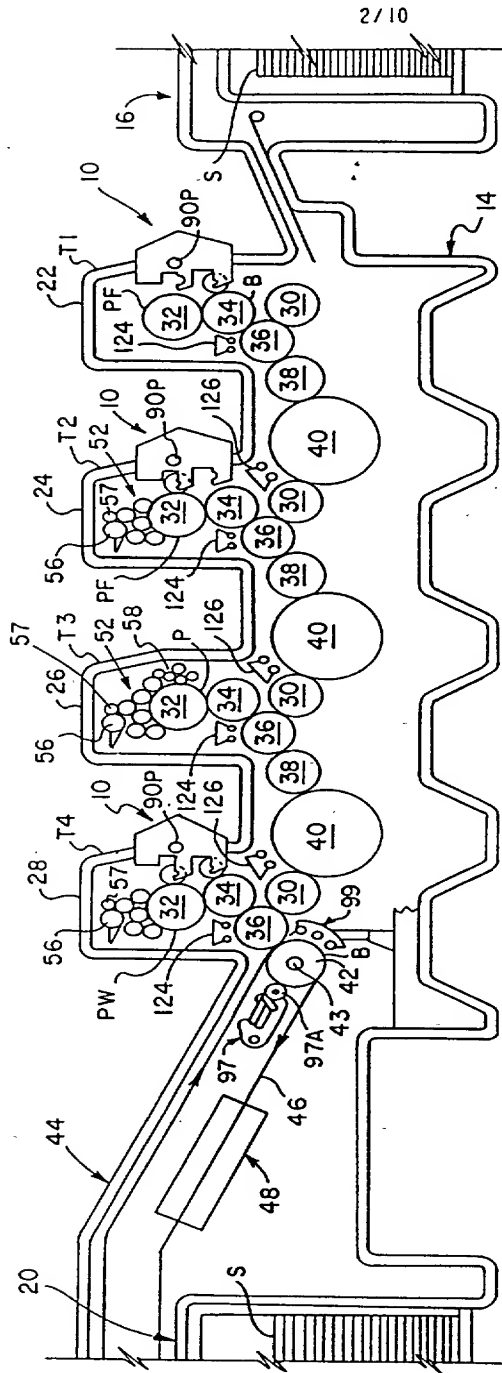
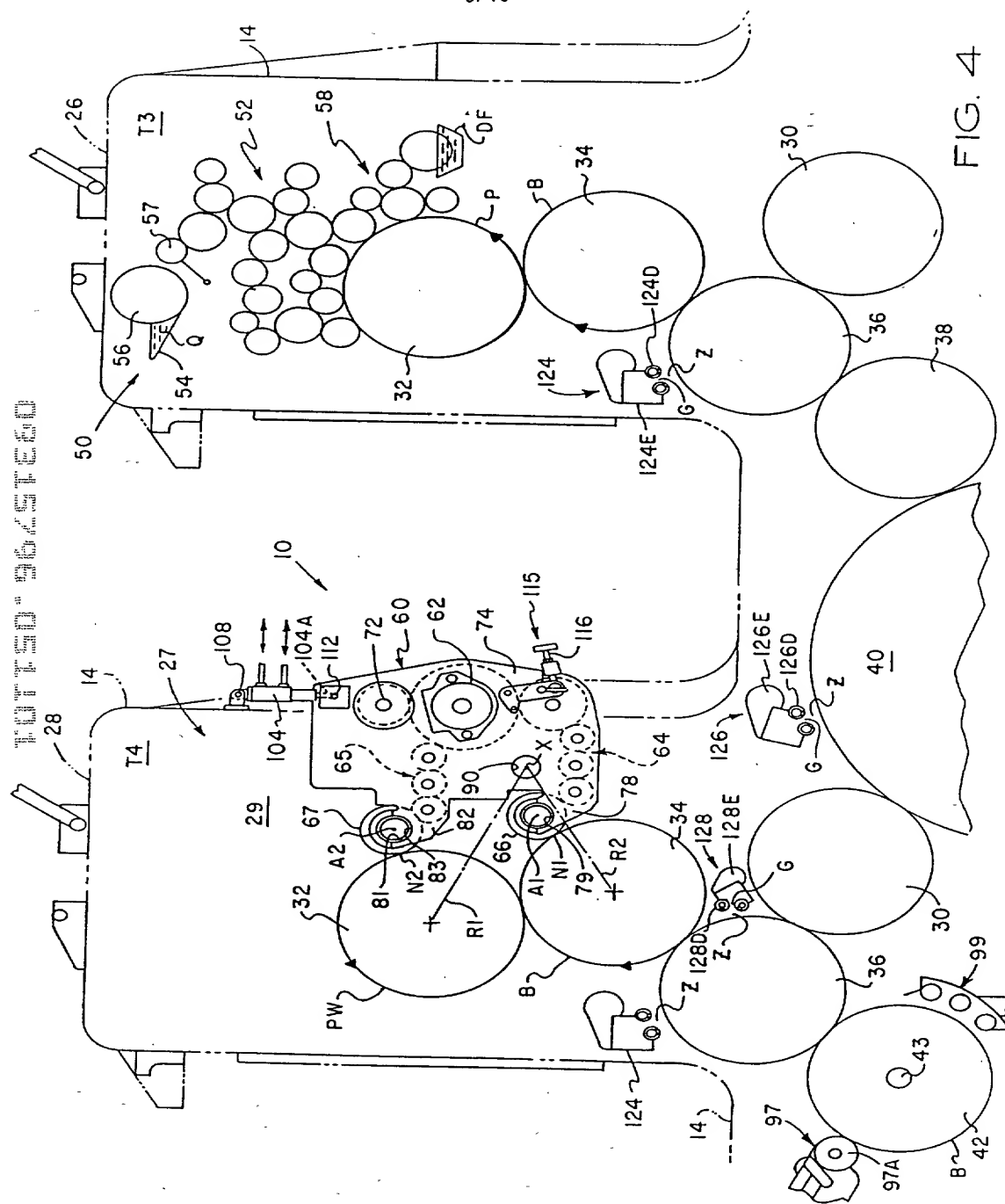


FIG. 3

HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

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HOWARD W. DEMOORE
RONALD M. RENDLEMAN
JOHN W. BIRD

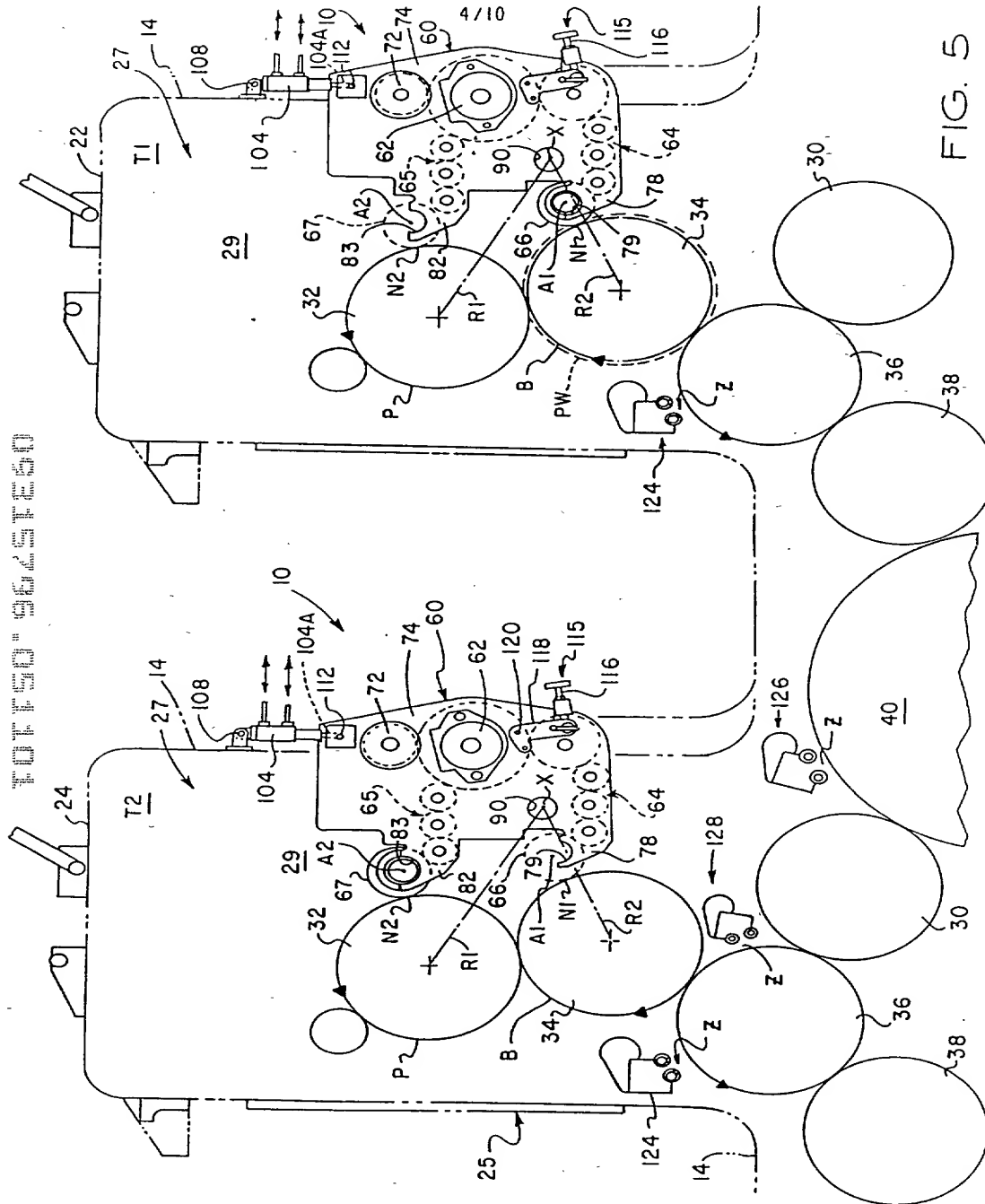
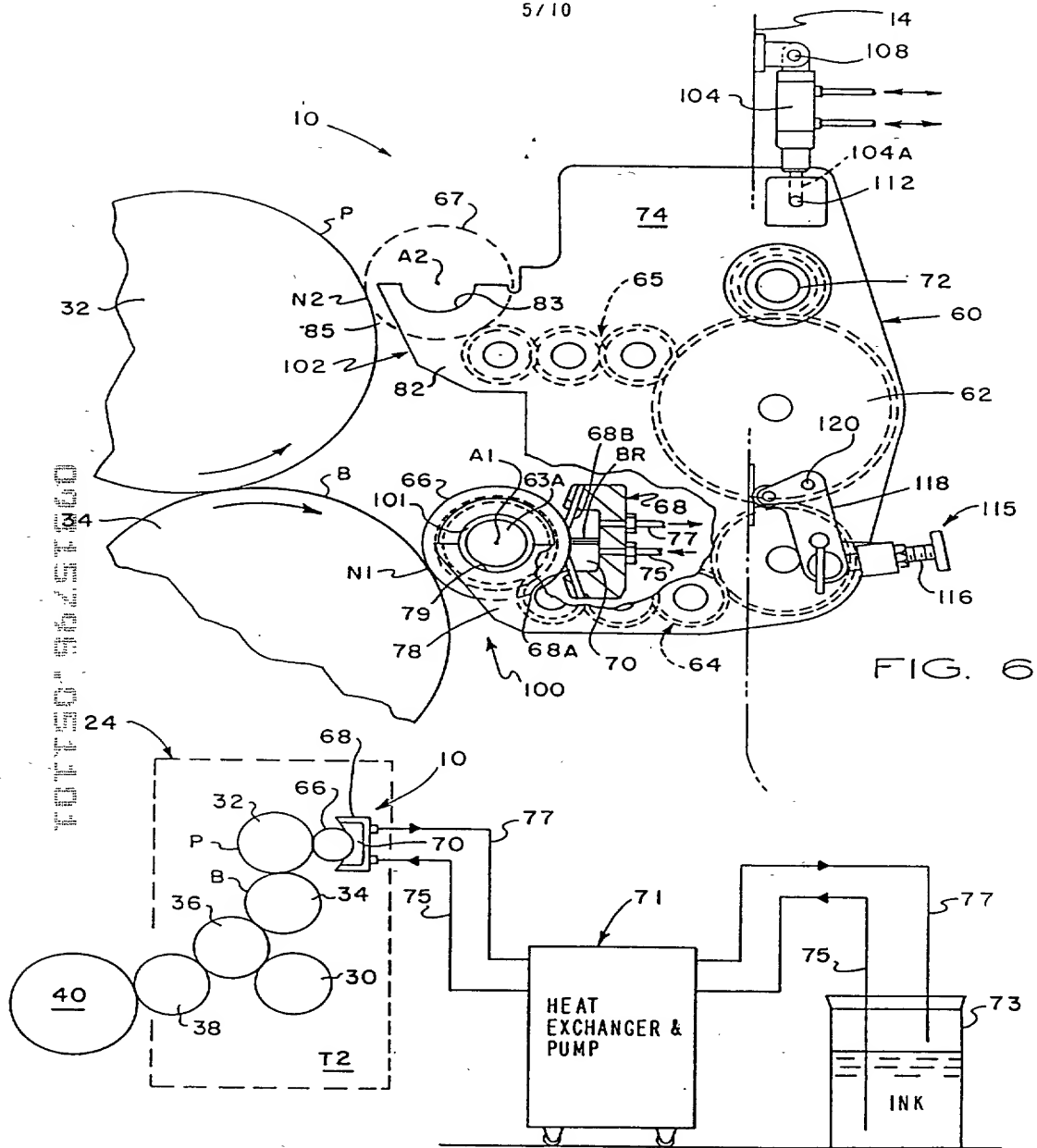


FIG. 5

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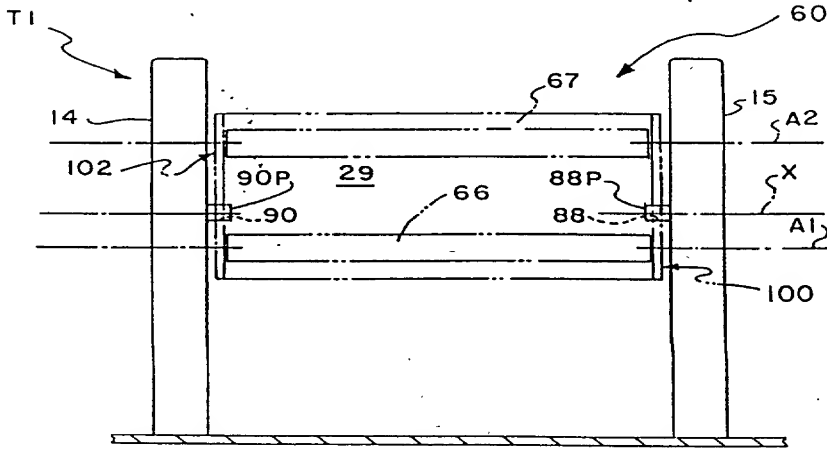
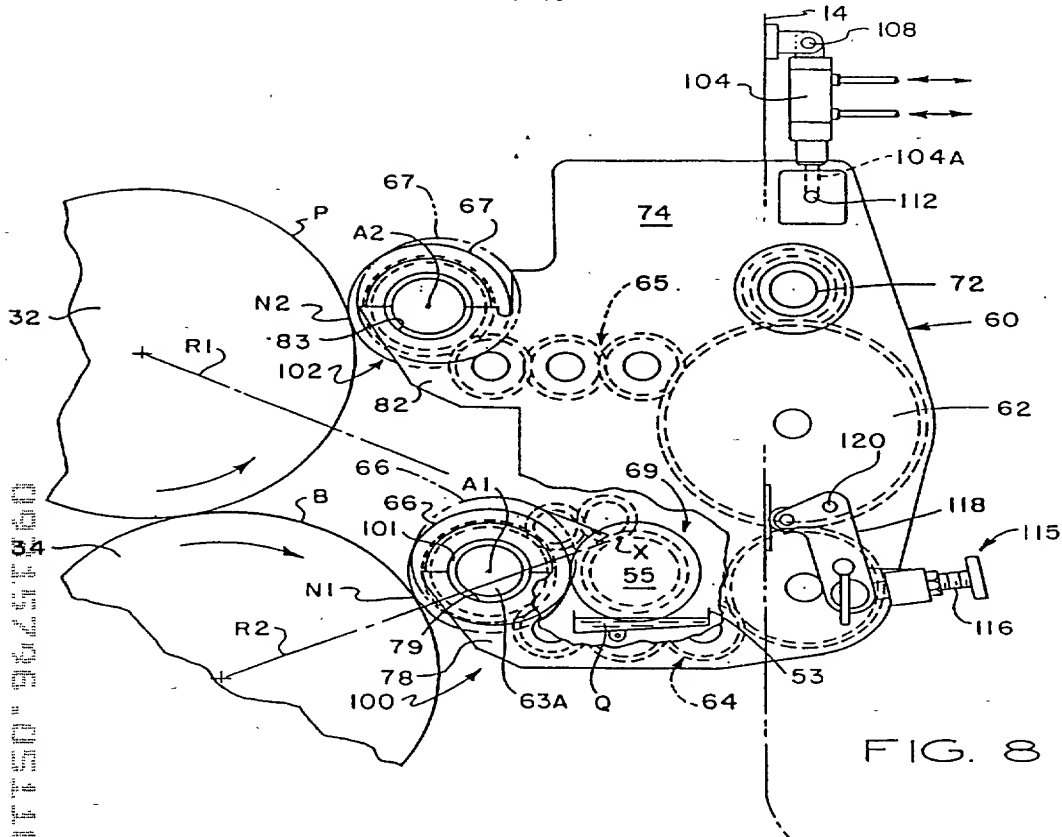


FIG. 9

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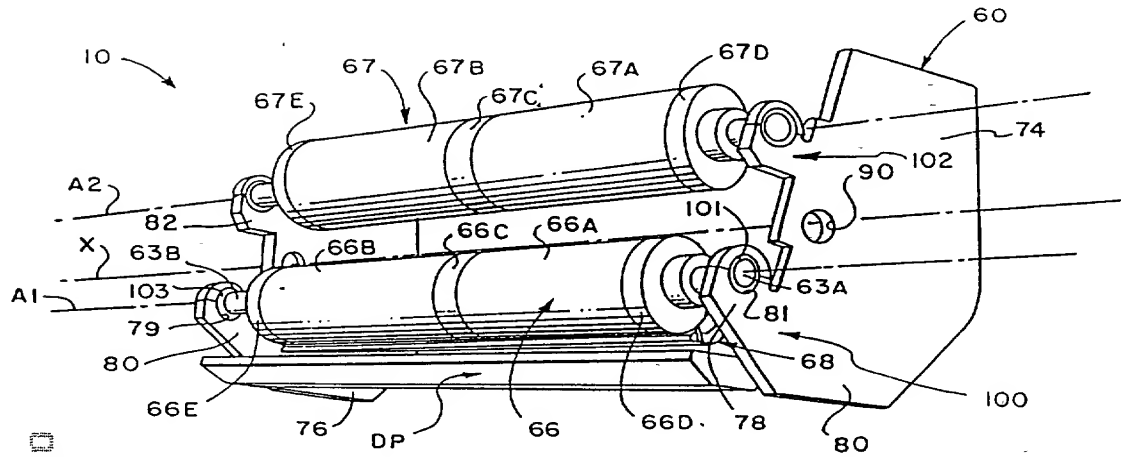


FIG. 10

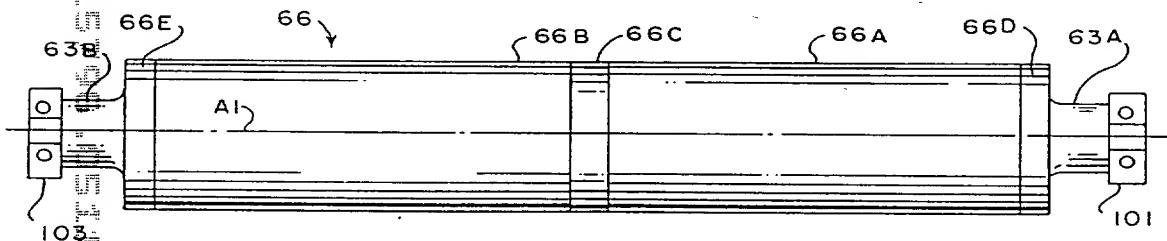


FIG. 11

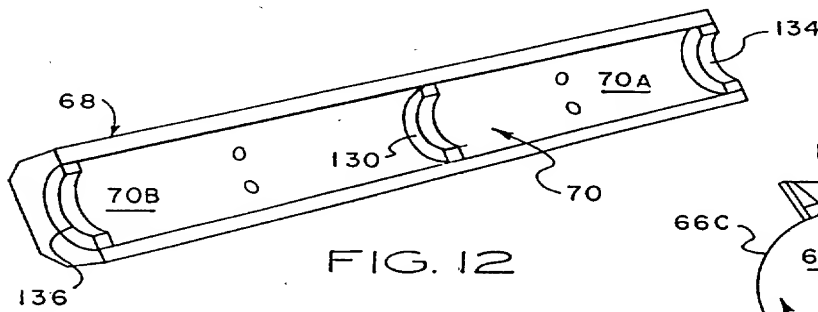


FIG. 12

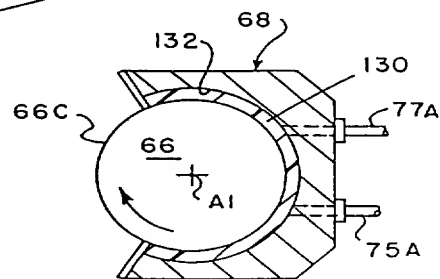
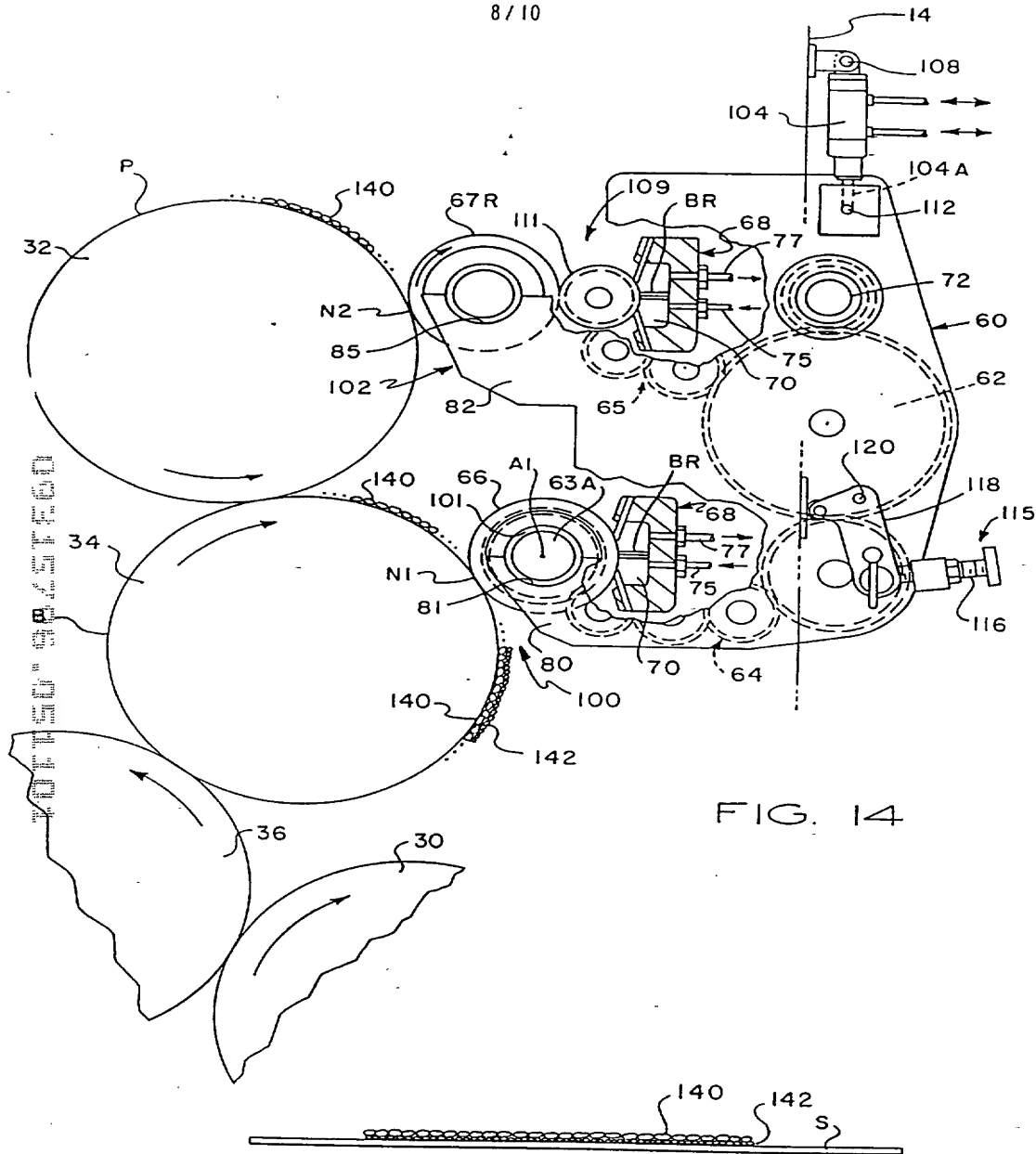


FIG. 13



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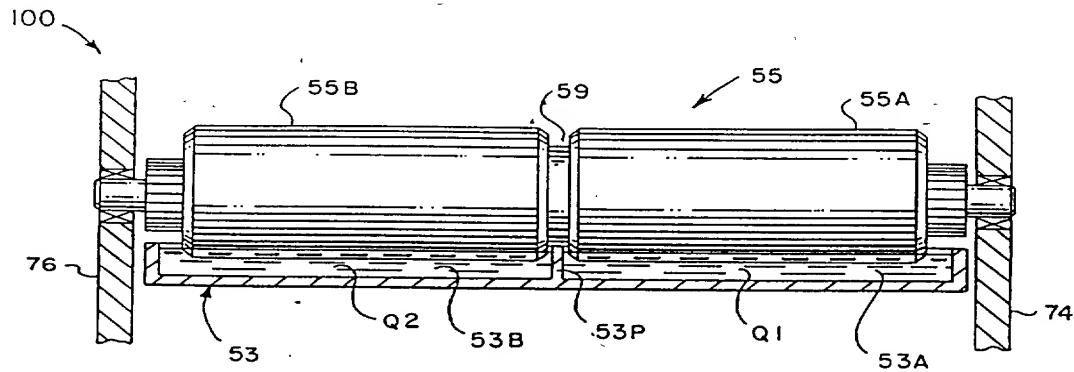


FIG. 16

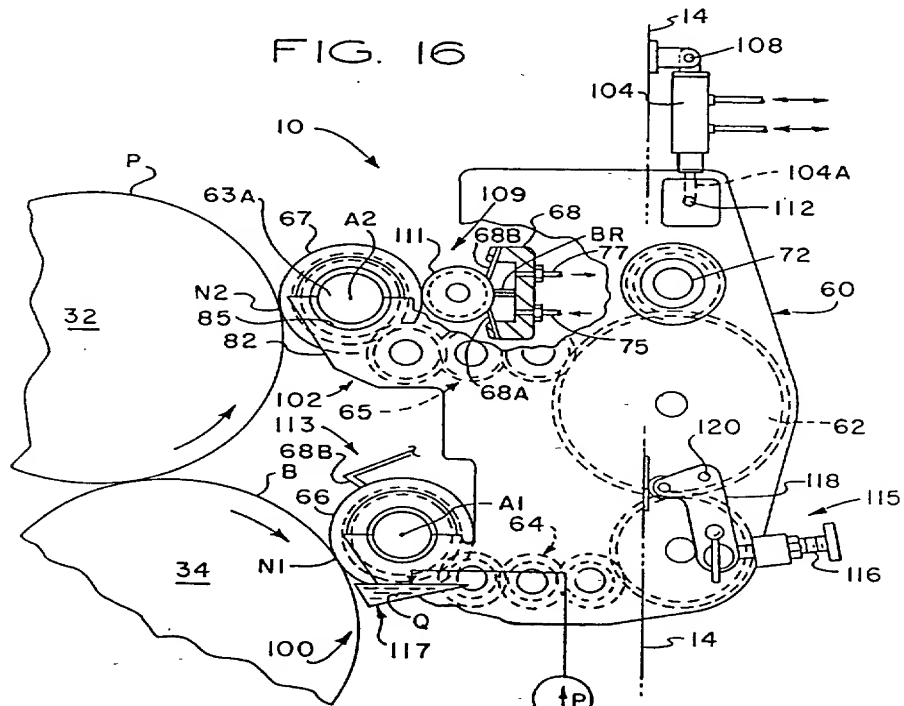
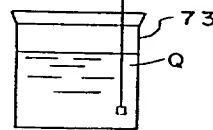


FIG. 17



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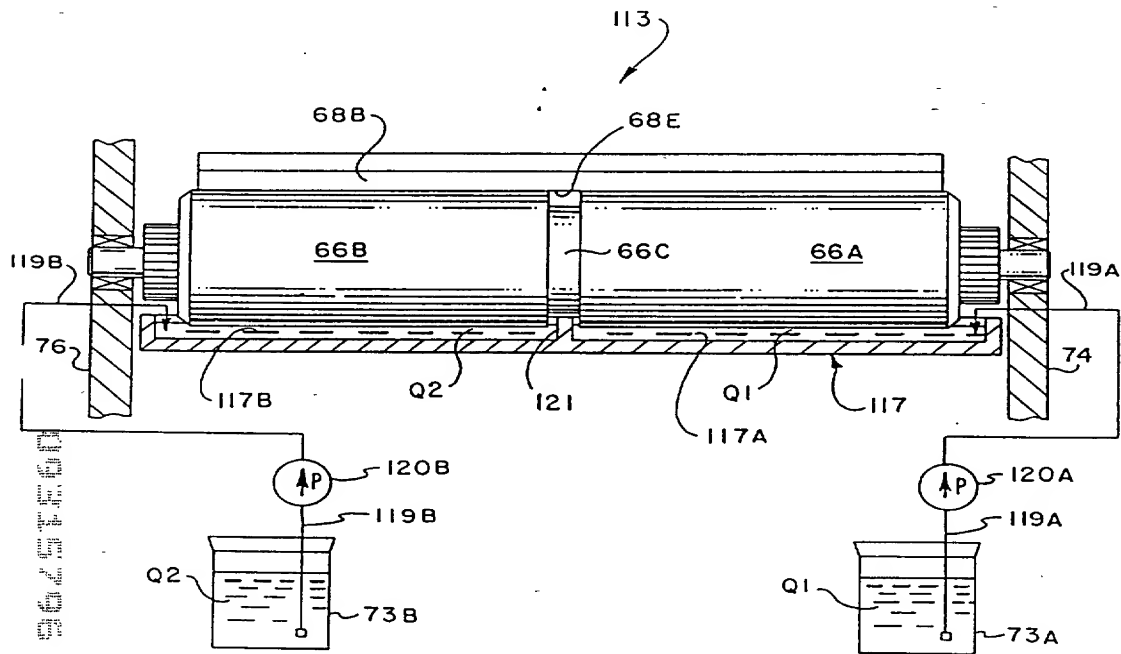


FIG. 18

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| 005 DEM | 5950,00 | DEST13AT | 231096! |
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Datum/Date
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| Zeichen/Ref./Ref P 44213 | Anmeldung Nr./Application No./Demande n°/Patent Nr./Patent No./Brevet n° 96250219.1-2304- |
| Anmelder/Applicant/Demandeur/Patentinhaber/Proprietor/Titulaire DeMoore, Howard W. | |

COMMUNICATION

The European Patent Office herewith transmits as an enclosure the European search report for the above-mentioned European patent application.

If applicable, copies of the documents cited in the European search report are attached.

☒ Additional set(s) of copies of the documents cited in the European search report is (are) enclosed as well.

The following specifications given by the applicant have been approved by the Search Division:

☒ abstract

☒ title

☐ The abstract was modified by the Search Division and the definitive text is attached to this communication.

The following figure will be published together with the abstract: 1

REFUND OF THE SEARCH FEE

If applicable under Article 10 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.





TOP SECRET

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int Cl.6) |
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| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 11 March 1998 | Examiner Loncke, J |
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| X particularly relevant if taken alone Y particularly relevant if combined with another document of the same category A technological background O non-written disclosure P intermediate document | | T theory or principle underlying the invention E earlier patent document, but published on, or after the filing date D document cited in the application L document cited for other reasons & member of the same patent family, corresponding document | |

**ANNEX TO THE EUROPEAN SEARCH REPORT
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For more details about this annex see Official Journal of the European Patent Office, No. 12/82